MONTHLY WEATHER REVIEW.

Editor: Prof. CLEVELAND ABBE.

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INTRODUCTION.

The MONTHLY WEATHER REVIEW for October, 1897, is based on 2,864 reports from stations occupied by regular and voluntary observers, classified as follows: 144 from Weather Bureau stations; numerous special river stations; 33 from post surgeons, received through the Surgeon General, United States Army; 2,525 from voluntary observers; 96 received through the Southern Pacific Railway Company; 14 from Life-Saving stations, received through the Superintendent United States Life-Saving Service; 32 from Canadian stations; 20 from Mexican stations; 7 from Jamaica, W. I. International simultaneous observations are received from a few stations and used, together with trustworthy newspaper extracts and special reports.

Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Mr. Curtis J. Lyons, Meteorologist to the Government Survey, Honolulu; Dr. Mariano Bárcena, Director of the Central Meteorological Observatory of Mexico; Mr. Maxwell Hall, Government Meteorologist, Kingston, Jamaica; Capt. S. I. Kimball, Superintendent of the United States Life-Saving Service; and Commander J. E. Craig, Hydrographer, United States Navy.

The REVIEW is prepared under the general editorial supervision of Prof. Cleveland Abbe.

Attention is called to the fact that the clocks and self-registers at regular Weather Bureau stations are all set to seventy-fifth meridian or eastern standard time, which is exactly five hours behind Greenwich time; as far as practicable, only this standard of time is used in the text of the REVIEW, since all Weather Bureau observations are required to be taken and recorded by it. The standards used by the public in the United States and Canada and by the voluntary observers are believed to generally conform to the modern international system of standard meridians, one hour apart, beginning with Greenwich. Records of miscellaneous phenomena that are reported occasionally in other standards of time by voluntary observers or newspaper correspondents are generally corrected to agree with the eastern standard; otherwise, the local meridian is mentioned.

STORM WARNINGS AND WEATHER FORECASTS.

By Lieut. Col. H. H. C. DUNWOODY, Supervising Forecast Official.

Under this head it is proposed to make note of all extreme and injurious weather conditions occurring during the month, and the warnings of the same issued by the Bureau, with instances, as far as reported by observers or the press, in which these warnings were of special public benefit. The signals displayed by the Weather Bureau will be referred to as "information," "storm," "hurricane," "cold wave," and "norther," respectively.

SEVERE STORMS.

The following report on the work of October has been prepared by Mr. H. E. Williams, Chief of Forecast Division:

Storm of October 19–21.—Two tropical storms for which hurricane signals were ordered occurred during October, viz, 19–21 and 23–26. The first was noted on the evening of the 19th as a slight depression east of Florida. It moved rapidly northeast toward the North Carolina coast, and on the morning of the 20th was central south of Hatteras, causing northeast winds of 34 and 26 miles at Hatteras and Henry, respectively. During the day it moved slowly northeast, increasing in intensity, and on the night of the 20th was apparently central off the east North Carolina coast, maximum velocities of 44 south and 60 northeast, occurring at Hatteras and Henry, respectively. Storm southeast signals were hoisted by the observer at Hatteras at 6 a. m. of the 20th, and at 10 a. m. the Central Office ordered storm northeast at Henry, Norfolk, and in Hampton Roads, and information signals from Breakwater to Nantucket. At 12:10 p. m. these latter were changed to storm northeast, and the same extended to Boston and section. Special reports of the development and progress of the storm were received during the day, and at 11:55 a. m. the observer at Norfolk was warned that the storm was likely to be very severe, and directed to notify all vessels that it would be dangerous to leave port. At 1 p. m. hurricane signals were ordered from Hatteras to Boston section, with the warning that the winds would probably reach hurricane velocity off the south New England and middle Atlantic coasts, and that it was dangerous for vessels to leave port. At 10 p. m. information signals were hoisted at Portland and Eastport, with the warning of severe east gales on the south New England coast Thursday morning (21st), and that winds would be likely to be brisk to high off the north New England coast Thursday. On the morning of the 21st the storm was central off the southeast New England coast, whence it passed during the day northeast beyond the region of observation. Northeast winds of 36 miles at Atlantic City, 38 at New York, 56 at Block Island, and 44 at Nantucket occurred during the night of the 20th and morning of the 21st.

Storm of October 23–26.—The second storm was first observed on the evening of the 23d, the p. m. synopsis of that date stating that "there are some indications of a depression to the east of Florida." Information signals had been ordered during the

afternoon for increasing northeast winds from Hatteras to Atlantic City, and at 10 p. m. storm northeast were hoisted at Hatteras and Henry, with warning of a possible depression southeast of Hatteras. During the night of the 23d the storm moved northward toward the North Carolina coast, causing northeast winds of 48 and 34 miles, respectively, at Hatteras and Henry. At 10:30 a. m. of the 24th storm northeast signals were ordered from Norfolk to Cape Cod section, and information at Baltimore and Boston, with warning that the storm to the south of Hatteras, moving slowly to the east of north, would probably cause dangerous northeast gales on the middle Atlantic and south New England coasts during the night.

Special noon observations of the 24th showed the storm to be increasing in energy, and at 2 p. m. hurricane signals were ordered from Hatteras to Cape Cod section, storm northeast at Boston and section, and information at Portland and Eastport, with warnings from Hatteras to Boston that winds would probably reach hurricane velocity from the North Carolina to the southeastern New England Coast, and that it was unsafe for vessels to leave port. The warning to Norfolk predicted that the evening tide would be higher than that of the morning in that vicinity. At 9:30 p. m. the signals at Boston and section were changed to hurricane, and at Portland and Eastport to storm northeast, and the official at Boston directed to use all available means to distribute the information. At 9:50 p. m. an additional message was sent to the observers at New York and Philadelphia, directing them to use all available means to warn shipping and other interests of the approaching storm. The storm continued to move slowly northward during the day and night of the 24th, and on the morning of Monday, the 25th, it was central as a storm of great energy near the Virginia coast, the barometer reading 29.32 at Norfolk.

Winds of 64 miles north at Cape Henry, 56 north at Hatteras, and 43 northeast at Atlantic City occurred during the day, and 48 northwest at Hatteras, 38 north at Norfolk, 52 northeast at Atlantic City, and 48 northeast at Block Island during the night of the 24th. At 10:50 a. m. of the 25th the officials at Boston, New York, Philadelphia, and Nantucket were again directed to use all available means to distribute warnings of the storm and to notify postmasters in their vicinity that the storm would cause winds of hurricane velocity near the coast Monday night and Tuesday.

During the 25th the storm moved to the southeast, a very unusual and unexpected direction of movement for a storm of this character, and the barometer rose at the center of the disturbance. Northeast winds of 48 miles at Cape Henry, 42 at Atlantic City and Block Island, and 40 at New York occurred during the 25th.

At 10:50 p. m. of the 25th signals were changed to storm northeast from Hatteras to Cape Cod Section, and observers notified that conditions were less threatening, although strong northeast gales were probable off the south New England and middle Atlantic coasts. During the night of the 25th the storm decreased in energy, remaining central near Hatteras, where it gradually disappeared, some effects of its presence continuing until the morning of the 27th.

COMMENTS OF THE DAILY PRESS.

It is impracticable, from the nature of the case, to obtain accurate estimate of the benefits derived from the warnings of these storms issued by the Bureau, but the reports received indicate that they were very great, particularly those in connection with the storm of the 23d–26th, which from New York south to Hatteras was the most violent and destructive that had occurred for years. Danger warnings and special telegraphic bulletins were displayed at all ports from twelve to twenty-four hours in advance of the hurricane, and the information widely disseminated by means of the telephone, telegraph, and signal rockets at night, and, as a result, few disasters to shipping occurred. Between 800 and 900 vessels were reported to have remained in port at harbors on the Atlantic Coast as a result of the signals.

A report from the Weather Bureau official at Norfolk states:

Practically all shipping tied up on Sunday and remained at their docks until Wednesday. The ocean liners which did not go out on account of the warnings were: Boston steamer, Providence steamer, New York steamer, and Philadelphia steamer. In addition to the regular schedule steamers, there were 20 tramp steamers, 16 of which were loaded with cotton and other merchandise from this port and other southern ports that had put in here for bunker coal; also 105 coastwise vessels, the majority loaded with lumber and coal; all received protection through the warnings of the Weather Bureau.

It is difficult to estimate the value of maritime property in this vicinity which was protected by the warnings, though it is in excess of $7,000,000 and 1,000 persons. It is estimated that $850,000 worth of cotton and other merchandise was saved from damage by high tides. Much damage to fish industries is reported from the coast district. Three wrecks were reported from the coast between Cape Henry and Hatteras.

At 10:30 p. m. of the 26th the German steamer *Polaria*, with a cargo of cotton-seed meal, cotton, and coffee, stranded off Cape Henry. The observer at that station notified the wrecking company at Norfolk at 10:35 p. m., and tugs were on the way to the assistance of the stranded vessel inside of two hours, and were alongside of her at daylight.

The great value, in the public estimation, of the work done by the Bureau in connection with these storms is shown by the following extracts from the public press in relation to the warnings issued, viz:

Norfolk Virginian, October 26.—That the loss of life and property has not been greater is due largely to the magnificent service of the Weather Bureau, whose hurricane signals were generally heeded. The Department also gave out valuable information regarding tides, enabling those who had the forethought to move their goods in stores along the river out of reach of the water. * * * Weather Observer Gray and his efficient staff not only earned their salaries several times over during the storm, but saved many thousand dollars' worth of property, and, perhaps, many lives, by vigilance and untiring effort to warn shipping and merchants.

Norfolk Landmark, October 26.—Farmer Gray and his assistants, from the conditions, at once recognized the possibility of danger to shipping due to the high winds, which originated off Hatteras, and which were slowly but surely traveling the coast line, notified transportation companies, and their prompt action very probably saved many lives. Knowing the direction of the wind and its effect upon the tides, all merchants in the lower part of the city who could be reached were warned, and thus considerable property was saved. * * * Because of the promptness of the weather officials in warning shipping, no serious results have as yet been reported to vessels.

Norfolk Daily Pilot, October 27.—Had it not been for the promptness of the local weather bureau, the loss here would probably have reached many millions instead of a few thousand dollars. The work of the wire from Norfolk to Hatteras has also been invaluable.

Baltimore American, October 26.—Undoubtedly the damage is large, but it would have been much larger had not the warnings of the Weather Bureau given the mariners notice of the coming of the storm.

Philadelphia North American, October 27.—The Weather Bureau at Washington has once more rendered valuable service to the shipping interests of the nation by its accurate forecast of the severe gale which swept along the Atlantic Coast on Monday. That more ships were not wrecked and more lives lost must be placed entirely to the credit of the timely warnings issued from the Weather Bureau, and we may once more congratulate ourselves upon having such an efficient corps of experts, always on the lookout for dangers from the elements.

Philadelphia Press, October 26.—If important shipping escaped the storm, it was largely due to the timely warning of the Weather Bureau, which has been watching the progress of the hurricane since it first touched the Florida coast last week.

New York Times, October 25.—A hurricane is raging off the Atlantic Coast, and mariners were warned yesterday not to go to sea. Chief Moore of the Weather Bureau at Washington sent out orders for the display of hurricane signals at the Delaware Breakwater, Reedy Island, Cape May, Sandy Hook, New York, Montauk Point, Newport, Narragansett, Woods Hole, and Cape Cod. The order was accompanied by a notice that a severe storm was central near Cape Hatteras, moving northeast, and likely to cause wind of hurricane velocity along the coast.

The chief followed this with another urgent notice at 11 o'clock last night.

"Use all available means," he wired, "to inform shipping and other interests of approaching storm, which will cause winds of hurricane velocity on the coast."

New York Journal, October 25.—Big Hurricane Due. Weather Office issues Two Warnings to Shipping—Raging about Hatteras. "Use all available means to inform shipping and other interests of approaching storm which will cause winds of hurricane velocity on the coast."—Bulletin from the Chief of the Weather Bureau at 11 o'clock last night.

Wild weather was sweeping from the south last night. Within a few hours yesterday Chief Moore of the Weather Bureau at Washington issued two warning bulletins, the second more urgent than the first.

The very word "hurricane," coming from an official, a scientific source, is enough to give pause to those who go down to the sea in ships, and the news from Atlantic City, printed below, shows that the dreaded visitant or one of its kindred was hard upon New York last night.

Here is Chief Moore's first bulletin:

"Hoist hurricane signals at 2 p. m. at Breakwater, Reedy Island, Cape May, Sandy Hook, New York, Montauk Point, Newport section, Narragansett section, Woods Hole section, and Cape Cod section. Severe storm center near Cape Hatteras, moving northeast, likely to cause wind of hurricane velocity along the coast to-night."

The second bulletin from Washington is quoted at the head of this article.

New York Mail and Express, October 25.—The blow, according to the weather cracks, extends all along the coast from Cape Hatteras to Maine. The surf is cutting up great capers everywhere along this extensive stretch of strand, and telegraphic reports furnish particulars of considerable damage to board walks and even beach cottages. The Weather Bureau has instructed all its branches between the points mentioned to warn all vessels not to leave port. Monday is generally a slow sailing day, but the caution exercised the attention of not a few mariners. Several coastwise schooners cleared Sandy Hook outward bound shortly after daylight, but when their skippers subsequently saw the great carnival of green and white water outside, and the cautionary signals flying at the observatory at the Hook, they decided to return to the lower bay to give old Æolus a chance to tire out.

New York Tribune, October 26.—The Washington Weather Bureau early yesterday morning had hurricane signals hoisted along the Atlantic Coast from Florida to Maine, and as a consequence vessels intending to sail remained in port. At no time during the day did the wind in this harbor exceed 40 miles, but the steamers *Flumineuse*, of the Red Cross Line, for Barbadoes, and the Clyde liner *Comanche*, for Charleston, the only passenger vessels scheduled to sail from here yesterday, refrained from venturing to sea. Some half dozen square riggers and schooners desirous of leaving port also remained at anchor in the roadstead about Liberty Island. There were anchored off Thompkinsville, Staten Island, five United States cruisers of the White Squadron, which arrived here on Sunday, and altogether the harbor presented a thoroughly stormbound appearance.

RAIN WARNINGS FOR THE RAISIN DISTRICT.

The raisin crop of California is of immense pecuniary value, and during the drying season accurate weather forecasts are of great benefit. The slightest rain materially injures the product, and a heavy rain almost entirely destroys it, if not protected, so that the growers are largely dependent on the forecasts for the success of the crop.

Light rain, amounting to about 0.06 of an inch, fell in the raisin district around Fresno on October 5, beginning between 2 and 3 p. m. Warnings for this rain were issued from the San Francisco office at 10 a. m., and generally disseminated, so that the fruit was protected and no material damage done.

On the 13th and 14th general rain, beginning in the afternoon of the 13th, occurred throughout the raisin district of southern California, 0.17 of an inch occurring at Fresno, 0.04 at San Luis Obispo, 1.74 at Los Angeles, and 0.67 at San Diego. Rain warnings were given to nearly all sections of the State from twelve to thirty-six hours in advance, and all fruit and raisin driers advised to stack their trays. The value to those interests amounted to many hundreds of thousands of dollars. General and heavy rain fell throughout southern California on the night of the 23d, of which warning was given in the morning forecast of that date and widely distributed.

COMMENTS OF THE DAILY PRESS.

The work of the Weather Bureau in all these instances was highly commended by the public press, as shown by the following extracts:

Los Angeles Express, October 16, 1897.—The San Diego County raisin growers got thirty-six hours' notice of Wednesday night's storm, and were thus enabled to take precautions that saved their crops. The Weather Bureau pays for itself many times over when it gives timely warning of one great storm. The establishment of a station in southern Nevada as contemplated will afford much needed protection to the fruit growers in the northern counties of southern California.

San Diego Sun, October 14, 1897.—Value of Weather Office. Some people are inclined to sneer at the United States Government for maintaining an expensive weather department, thinking its chief value to be in collecting records and statistics. But Manager Donald of the Boston ranch and other raisin growers in Cajon Valley, big and little, feel differently, for they know by experience that Uncle Sam's weather man has already saved them thousands of dollars on this one storm alone. Two days ago the office at San Francisco predicted probable showers, and Mr. Carpenter from the San Diego office sent out bulletins to all points in this region. Special efforts were made to keep Cajon Valley and the raisin district posted, and as a result the bulk of the crop, which is yet in the field, was gathered into stacks, covered and otherwise protected from the rains. A conservative estimate of the loss if the raisins had been left on the trays is $15,000.

Extract from private letter to the Forecast Official, Weather Bureau, at San Francisco:

Your telegrams have saved thousands of dollars of raisins and hay. There are many men who take advantage of the predictions, in a matter of fact way, and though thankful say nothing.

Editorial in San Francisco Chronicle of October 25, 1897:

Weather News for Farmers. The Weather Bureau at San Francisco has done excellent forecast work this fall, partly because of the facilities given it on Mount Tamalpais, but mainly because of the scientific accuracy of Mr. Hammon. All the warnings so far sent out were promptly justified by the event. Raisin growers of the San Joaquin, on this account, have been able to anticipate storms and precipitation in time to get their grapes under cover.

San Francisco Bulletin, October 6, 1897.—The advantages of the Weather Bureau warnings were demonstrated by the fact that, in those districts where there was no station, the drying raisins have been injured. The aid given by the Southern Pacific and the Valley roads in disseminating intelligence has proved invaluable.

Orange, Cal., Post, October 23, 1897.—The predictions of rain sent out from the United States Weather Bureau saved the raisin makers of San Diego County thousands of dollars.

Editorial in San Francisco Chronicle of November 17, 1897:

Good Weather Service. The good record made by the local weather bureau this fall, in giving out rain forecasts to the raisin pickers, has received the official praise of the Agricultural Department. In his latest report Secretary Wilson says—

"The rain warnings issued from the San Francisco office for the benefit of the raisin industry during the drying season, and on the accuracy of which that industry is greatly dependent for success, were in every instance justified. The official in charge of the San Francisco office states in reference to the work of the Bureau in this particular that during the last three years not a single rain occurred in the raisin-drying region without warning, and in only one instance was an unneccessary warning issued."

We have spoken before of the accuracy of this service which, it may be added, has steadily improved since the Bureau was taken out of the Army, and which is now a dependable safeguard for farmers and horticulturists through the year. It would be difficult to make husbandry pay in this State in anything like its present scale or variety, except for the rain and frost warnings of the Weather Bureau. By means of these tens of thousands of dollars are annually saved in the vineyards alone. The good already done will, we hope, incline the California delegation to take a favorable view of the recommendation of Secretary Wilson that new stations be located in the southeastern part of California and in neighboring States and Territories, where conditions affecting our weather sometimes have birth. We can not enjoy too much of so good a thing as a service that eliminates the meteorological element of chance from farming interests.

AREAS OF HIGH AND LOW PRESSURE.

By Prof. H. A. HAZEN.

During October there were 10 high and 12 low areas of sufficient definiteness to be traced upon Charts I and II. Upon these charts the small circle shows the approximate position of each high and low at 8 a. m. and 8 p. m., eastern time. Within the circle is placed the reading of the barometer near the center and also the date. The principal facts regarding the place of origin and also of disappearance, the length and duration of each high and low, as also the velocity, is given in the accompanying table, and the following description is added.

HIGHS.

Five of the highs were first noted on or near the north Pacific Coast. Two of these reached the Atlantic Coast, the other three disappeared in the interior. The month was remarkable in that highs III, V, VII, VIII, and X began in the interior of the United States. All of the highs except II and IX were last noted off or near the Atlantic Coast.

Decided falls in temperature occurred in connection with these highs as follows: While II was in Idaho the temperature fell 28° in twenty-four hours at Huron, a. m. of 3d. On 9th, a. m., while IV was to the north of Montana there was a fall of 28° at Des Moines. As high VI passed into South Dakota, evening of 16th, there was a fall of 36° at Dodge City and Concordia. The next morning VI had moved to Wisconsin, and there was a fall in temperature of 36° at Northfield and of 32° at Oswego and Rochester. While high area IX moved to Wyoming on the evening of the 26th there was a temperature fall of 36° at Moorhead, and of 30° at Huron.

LOWS.

Two lows during the month, VII and XI, began in the eastern part of the Gulf of Mexico and moved up the Atlantic Coast. These storms were quite severe on several days and shipping was fully warned. Storms II, III, IV, V, and XII began to the north of Montana; I, IX, and X, off or near the north Pacific Coast; VI began and ended near the Rocky Mountain slope; and VIII began in Ontario. The last seen of I, V, IX was in Manitoba, or near Lake Superior; II, III, IV, VIII, and XII disappeared over Newfoundland; while VI and X were last noted in the Southwest.

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocities.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long W.	Length.	Duration.	Daily.	Hourly.
High areas.		°	°		°	°	*Miles.*	*Days.*	*Miles.*	*Miles.*
I	28, a. m.	42	127	5, p. m.	36	81	4,390	7.5	585	24.4
II	3, p. m.	47	122	7, p. m.	27	98	2,200	4.0	550	22.9
III	6, p. m.	48	101	9, a. m.	32	79	2,020	2.5	808	33.7
IV	7, a. m.	52	118	12, a. m.	48	55	3,290	5.0	658	27.4
V	12, a. m.	41	103	16, p. m.	34	76	2,780	4.5	618	25.8
VI	15, a. m.	43	121	19, p. m.	39	73	2,740	4.0	685	28.5
VII	19, a. m.	49	84	22, p. m.	43	69	1,350	3.5	386	16.1
VIII	19, p. m.	43	110	27, p. m.	44	60	3,650	8.0	456	19.0
IX	24, a. m.	42	126	29, p. m.	38	103	1,950	5.5	354	14.8
X	29, p. m.	34	93	1, a. m.	46	59	2,040	2.5	816	34.0
Total	......	....	....	......	....	....	26,410	47.0	5,916	......
Mean of 10 tracks	......	....	....	......	....	....	2,641	......	592	24.7
Mean of 47 days	......	....	....	......	....	....	......	......	562	23.4
Low areas.										
I	29, p. m.	49	123	2, p. m.	54	103	1,170	3.0	390	16.2
II	3, p. m.	54	112	7, p. m.	47	55	2,700	4.0	675	28.1
III	6, p. m.	53	116	9, p. m.	47	53	2,880	3.0	960	40.0
IV	10, a. m.	54	116	13, a. m.	50	61	2,490	3.0	830	34.6
V	12, a. m.	52	117	14, a. m.	46	92	1,320	2.0	660	27.5
VI	13, p. m.	43	104	15, p. m.	33	106	820	2.0	410	17.1
VII	15, a. m.	22	84	21, a. m.	41	69	2,460	6.0	410	17.1
VIII	16, a. m.	47	77	17, p. m.	48	52	1,240	1.5	827	34.5
IX	20, p. m.	50	124	23, a. m.	52	93	1,440	2.5	576	24.0
X	22, p. m.	46	127	27, a. m.	31	95	2,840	4.5	631	26.3
XI	23, a. m.	24	81	26, p. m.	34	73	1,470	3.5	420	17.5
XII	26, p. m.	54	114	29, p. m.	49	53	2,700	3.0	900	37.5
Total	......	....	....	......	....	....	23,530	38.0	7,689	......
Mean of 12 tracks	......	....	....	......	....	....	1,961	......	641	26.7
Mean of 38 days	......	....	....	......	....	....	......	......	619	25.8

CLIMATOLOGY OF THE MONTH.

By A. J. HENRY, Chief of Division of Records and Meteorological Data.

GENERAL CHARACTERISTICS.

Unusual warmth and dryness in almost all sections were the chief characteristics of the month.

From the 1st to the 10th occasional light rains prevailed in the Lake Region; elsewhere, the drought referred to in the September REVIEW continued. From the 10th to the 13th general rains occurred throughout the Southwest, the Plains, the Mississippi Valley, and eastward to the Atlantic. In some regions the rains were light and drought still prevailed at the end of the month. An area of cloud and rain hovered over the Atlantic Coast from the 19th to the 30th, giving an abundance of moisture to the immediate coast region. On the 31st an area of low pressure appeared in the lower Mississippi Valley, and the month closed with prospects of good rains throughout the drought-stricken regions. The rainfall of Nevada, Utah, Wyoming, Colorado, portions of Texas, Kansas, Nebraska, and South Dakota was above the normal.

The weather was very favorable to the gathering of crops but too dry for seeding. Killing frosts came too late in the month to cause much damage.

There were no severe local or general storms. Heavy snows (13.2 inches at Denver) and high winds prevailed over Colorado and Wyoming on the 26th, causing a general blockade of street car lines and much damage to telegraph and telephone wires.

Heavy fog prevailed over the Great Lakes from the 24th to the 27th, inclusive, greatly impeding navigation and causing numerous strandings and minor casualties.

Forest fires were numerous in northern New York, Ohio, and other regions, where the lack of rain greatly increased the danger of combustion.

ATMOSPHERIC PRESSURE.

[In inches and hundredths.]

Pressure was generally higher than usual, and the geographic distribution was not in close accord with normal conditions.

As will be seen by an examination of Chart IV, the eastern area of high pressure occupies the Middle States and New England instead of the South Atlantic States, as in months when normal conditions prevail. The Pacific high lies just to the northeast of the Great Basin and is inclosed by the isobar of 30.10 inches. Ordinarily this area of high pressure lies farther to the westward, and is generally bounded by an isobar opening on the Pacific Ocean.

The pressure distribution of the current month belongs to the dry weather type, of which a number of instances have occurred during the last twenty-five years. The month of October, 1879, furnishes almost an exact counterpart of the current month as regards the three elements, pressure, heat, and moisture.

The distribution of mean atmospheric pressure reduced to sea level, as shown by mercurial barometers, not reduced to standard gravity, and as determined from observations taken daily at 8 a. m. and 8 p. m. (seventy-fifth meridian time), is shown by isobars on Chart IV. That portion of the reduction to standard gravity that depends on latitude is shown by the numbers printed on the right-hand border.

The numerical values of Table I should be consulted for additional details.

TEMPERATURE OF THE AIR.

[In degrees Fahrenheit.]

Temperature was much above the normal in almost all districts. A period of midsummer heat occurred throughout the Mississippi and Ohio valleys, the Lake Region, the Middle States, and New England from the 14th to the 16th. Daily maximum temperatures, higher than ever before recorded in October, were observed at a number of stations. In some cases the heat was accompanied by high winds that stirred up the dust and made locomotion extremely disagreeable.

The mean temperatures and the departures from the normal, as determined from records of the maximum and minimum thermometers, are given in Table I for the regular stations of the Weather Bureau, which also gives the height of the thermometers above the ground at each station. The mean temperature is given for each station in Table II, for voluntary observers.

The *monthly mean temperatures* published in Table I, for the regular stations of the Weather Bureau, are the simple means of all the daily maxima and minima; for voluntary stations a variety of methods of computation is necessarily allowed, as shown by the notes appended to Table II. The mean temperatures given in Table III for Canadian stations are the simple means of 8 a. m. and 8 p. m. simultaneous observations.

The *regular diurnal period* in temperature is shown by the hourly means given in Table V for 29 stations selected out of 82 that maintain continuous thermograph records.

The *distribution of the observed monthly mean* temperature of the air over the United States and Canada is shown by the dotted isotherms on Chart IV; the lines are drawn over the Rocky Mountain Plateau region, although the temperatures have not been reduced to sea level, and the isotherms, therefore, relate to the average surface of the country occupied by our observers; such isotherms are controlled largely by the local topography, and should be drawn and studied in connection with a contour map.

The *years of highest and lowest mean temperatures* for October are shown in Table I of the REVIEW for October, 1894. The mean temperature for the current month was the highest on record at: Harrisburg, 56.1; Raleigh, 63.0; Columbia, S. C., 66.0; Shreveport,* 71.6; Fort Smith, 67.9; Little Rock, 69.3; Corpus Christi, 74.8; Palestine, 71.7; Memphis,* 69.8; Lexington, 63.9; Louisville,* 64.8; Parkersburg, 59.8; Sault Ste. Marie, 47.0; Milwaukee,* 56.2; Greenbay, 52.9; Moorhead, 48.4; Minneapolis, 53.4; Keokuk,* 61.8; Cairo,* 66.0; Hannibal, 62.4; St. Louis,* 66.3; Columbia, Mo., 64.1; Kansas City, 63.8; Springfield, Mo., 65.8; Topeka, 63.0; Concordia, 60.4; Dodge City,* 59.8; Wichita, 63.6; Oklahoma, 66.0. It was the lowest on record only at Carson City, 47.6.

The *maximum and minimum temperatures* of the current month are given in Table I. The highest maxima were: 100, Phœnix (6th); 99, Yuma (frequently); 94, Palestine (6th), Concordia (frequently); 93, Williston (1st), Little Rock, Vicksburg, Shreveport, (3d). The lowest maxima were: 58, Tatoosh Island (7th); 65, Olympia (4th); 68, Seattle (6th); 69, Port Angeles (6th). The highest minima were: 70, Key West (19th); 63, Port Eads (frequently); 59, Jupiter (25th), New Orleans (30th); 56, Galveston (29th), Tampa (31st). The lowest minima were: 13, Bismarck (9th); 14, Lander (27th); 16, Moorhead (9th); 17, Williston (9th); 18, Havre, Northfield (31st); 19, Denver (17th); 20, Idaho Falls (27th), Cheyenne (26th).

The *years of highest maximum and lowest minimum temperatures* for October are given in the last four columns of Table I of the REVIEW for October, 1896. During the current month the maximum temperatures were equal to or above the highest on record at: Portland, Me.,* 84; Nantucket, 72; Woods Hole, 77; Vineyard Haven, 80; Block Island, 75; Narragansett Pier, 82; New Haven,* 86; Albany,* 88; Harrisburg, 86; Philadelphia,* 88; Atlantic City,* 86; Baltimore,* 90; Lynchburg,* 92; Raleigh, 89; Little Rock, 93; Corpus Christi, 90; Galveston,* 91; Lexington, 88; Louisville,* 91; Indianapolis,* 89; Cincinnati,* 88; Columbus, Ohio, 90; Parkersburg, 90; Toledo,* 90; Detroit,* 88; Port Huron,* 87; Sault Ste. Marie, 78; Chicago,* 87; Milwaukee,* 88; Moorhead, 90; Bismarck,* 89; Minneapolis, 86; La Crosse,* 88; Davenport,* Des Moines, 90; Dubuque,* 89; Keokuk,* 92; Cairo,* 90; Springfield, Ill., Hannibal, and St. Louis,* 91; Kansas City, Springfield, Mo., 90; Omaha,* 91; Yankton,* 89; Miles City, 88; North Platte, 90; Amarillo, 85; Port Angeles, 69; Eureka, 84; Point Reyes Light, 79. The minimum temperatures were equal to or below the lowest on record at: Abilene, 34; Amarillo, 27.

* Observations cover a period of twenty-five years, or more.

The *greatest daily range of temperature and the data for computing the extreme and mean monthly ranges* are given for each of the regular Weather Bureau stations in Table I. The largest values of the greatest daily ranges were: North Platte and Northfield, 50; Pueblo, 48; Dodge City and Columbia, Mo., 46; Winnemucca and Pierre, 45. The smallest values were: Tatoosh Island, 12; Key West, 13; Port Eads, 15; Hatteras, 16; Jupiter, 17; Block Island, Charleston, and Astoria, 18.

Among the *extreme monthly ranges* the largest were: Williston and Bismarck, 76; Moorhead, 74; Huron and Concordia, 67; Miles City, 66; North Platte, 65; Havre and Northfield, 64. The smallest values were: Key West, 16; Tatoosh Island, 17; Port Eads, 21; Hatteras, 23; Jupiter, Galveston, and San Diego, 25.

Considered by districts the mean temperatures of the current month show departures from the normal as given in Table I. The greatest positive departures were: Upper Mississippi, 6.6; Ohio Valley and Tennessee, 5.5; Missouri Valley, 5.4. The greatest negative departure was: South Pacific, 2.7.

In Canada.—Prof. R. F. Stupart says:

The temperature was above average in all portions of Canada except over Vancouver Island, Cape Breton, and Prince Edward Island, at all of which points, however, it was below only to the extent of 1. As a rule, it was decidedly above the average; this was especially the case in Manitoba and throughout the Lake Region and the Ottawa Valley, many places giving as much as 5, and locally as much as 7 was recorded. The Niagara Peninsula gave a very high mean in all localities, the difference above average ranging from 6 to 7.

Accumulated monthly departures from normal temperatures from January 1 to the end of the current month are given in the second column of the following table, and the average departures are given in the third column, for comparison with the departures of current conditions of vegetation from the normal condition.

Districts.	Accumulated departures. Total.	Accumulated departures. Average.	Districts.	Accumulated departures. Total.	Accumulated departures. Average.
	°	°		°	°
New England	+ 5.5	+ 0.6	Florida Peninsula	− 3.1	− 0.3
Middle Atlantic	+ 3.0	+ 0.3	Southern Plateau	− 6.5	− 0.6
South Atlantic	+ 2.8	+ 0.3	Middle Plateau	− 6.7	− 0.7
East Gulf	+ 5.9	+ 0.6	Middle Pacific	− 2.3	− 0.2
West Gulf	+13.1	+ 1.3	South Pacific	− 7.6	− 0.8
Ohio Valley and Tenn.	+ 8.4	+ 0.8			
Lower Lake	+ 8.9	+ 0.9			
Upper Lake	+19.8	+ 2.0			
North Dakota	+ 8.1	+ 0.8			
Upper Mississippi Valley	+16.2	+ 1 6			
Missouri Valley	+15.2	+ 1.5			
Northern Slope	+ 5.1	+ 0.5			
Middle Slope	+12.2	+ 1.2			
Southern Slope	+ 1.8	+ 0.2			
Northern Plateau	+ 8.6	+ 0.9			
North Pacific	+ 0.4	0.0			

FROST.

Agricultural products suffered comparatively little injury by frost during the month.

High temperatures and dry weather, conditions favorable for harvesting late crops, prevailed during the first half of the month. The first killing frost of wide extent occurred from the 29th to the 30th. Killing frosts also occurred in various localities after the middle of the month, but generally too late to do serious harm.

Following is a summary of reports by directors of the various climate and crop sections:

Alabama.—Light frost was general in the northern and central counties on the 25th and 26th; heavy frost in a few places on the 24th, 25th, 26th, 29th, and 30th.

Arizona.—Light at a number of places on the 11th, 16th, 17th, 26–28th, and 30th; killing on the 17th, 24th, 27th, and 28th.

Arkansas.—Light frost on the 29th and 30th; killing frost also reported in some localities on the same dates.

Colorado.—Killing frost was not general until after the middle of the month.

Georgia.—Light frost at a few places on the 4th and 5th, and at a number of places on the 30th; heavy at two stations on the 29th.

Kansas.—Killing frost on the 19th, 21st, 27th–31st.

Kentucky.—Light frost at a few places from the 4–8th, and from the 18–20th, and at a number of places from the 23d–26th; killing at a few places on the 2d, 3d, 5th, 8th, 14th, 21st, 23d, 25–27th, and at a number of places from the 29th to the 31st.

Maryland and Delaware.—Light on the 4th and 5th, 18th and 19th, and on the 30th and 31st; killing at a few places on the 4th and 5th; general on the 18th and 19th and also on the 30th and 31st.

Minnesota.—In the southern portions much vegetation escaped serious injury by frosts till the 9th, when it is probable that the frost of that date destroyed all annuals not previously injured.

Mississippi.—Light on the 7th, 8th, and 21st, also from the 24th to the 30th; killing at a few places on the 30th.

Missouri.—Killing quite general on the 29th and at various points on every date from the 20th to the 31st.

Nebraska.—The first killing frost of the season occurred on the 9th in the northern portion of the State and on the 29th in the southern portion.

Nevada.—Light on the 15th and 30th at two stations; killing from the 14th to 17th, and at a few stations on the 26th.

New Jersey.—Light general on the 4th and at a number of places on the 5th and 18th; killing at a number of places on the 3d, 4th, 10th, 18th, and 31st.

New Mexico.—No damaging frosts until the last week in the month.

North Carolina.—Light frost in a few places on the 1st, 2d, 4th, 6–8th, and 20th–21st; general on the 30th and 31st; killing at a number of places on the 4th and 5th and also from the 29th–31st.

Ohio.—Killing frost from the 3d to the 10th, 17th, 18th, 22d, 27th, 29th–31st.

Oklahoma.—Light to heavy at all stations on the 29th, the first of the season.

South Carolina.—Light at a few stations on the 4th and 5th and from the 29th to the 31st.

South Dakota.—Killing at a number of stations, first of the season, on the 2d, also on the 7–9th, 14–16th.

Tennessee.—Heavy to killing frost on the 30th.

Texas.—Light on the 11th and from the 26th to the 31st; killing from the 28th to the 31st.

Virginia.—Light at a number of stations from the 3d to the 8th, 18th, and 30th–31st; killing at one station on the 4th, 5th, and 8th, at a few stations on the 18–19th, and at a number of stations on the 30th–31st.

PRECIPITATION.

[In inches and hundredths.]

The current month was one of the driest that has been experienced during the last twenty-five years. The drought referred to in the September REVIEW continued until the 12th of the month, when general rains occurred throughout the regions east of the Rocky Mountains. In some places, however, the fall was very light, and the drought was only partially broken. Moreover, a second period of drought set in after the rains of the 10–12th that was not broken until the end of the month.

The following table exhibits some of the details of the drought in various localities:

Station.	Total precipitation.				Normal.	Percentage.
	From—	To—	Days.	Inches.		
Little Rock, Ark	Aug. 11	Oct. 27	77	0.97	7.85	12
Vicksburg, Miss	Aug. 20	Oct. 30	71	1.56	7.19	22
Keesees Ferry, Ark	Aug. 14	Oct. 30	77	0.41	....	....
Columbia, Mo	Aug. 25	Oct. 30	66	1.15	5.51	21
St. Louis, Mo	Aug. 1	Oct. 31	91	1.06	9.39	11
Chattanooga, Tenn	Aug. 24	Oct. 11	48	0.07	5.82	1
Memphis, Tenn	Sept. 1	Oct. 30	59	0.32	5.68	6
Nashville, Tenn	Aug. 24	Oct. 11	48	0.31	5.85	5
Charlotte, N. C	Aug. 23	Oct. 11	49	0.90	5.94	15
Lynchburg, Va	Aug 1	Oct. 11	71	2.06	8.90	23
Parkersburg, W. Va	Aug. 26	Oct. 31	66	0.60	6.86	9
Columbus, Ohio	Sept. 2	Oct. 31	59	0.84	5.08	17
Sandusky, Ohio	Sept. 2	Oct. 31	59	0.83	5.39	15
Chicago, Ill	Aug. 10	Oct. 31	82	1.33	7.71	17
Louisville, Ky	Aug. 23	Oct. 10	48	0.75	4.47	17

At the end of the month an area of low pressure, accompanied by cloud and rain, appeared in the lower Mississippi Valley, and the month closed with good prospects for heavy rains in the drought-stricken region.

Considered by districts the rainfall of the current month was below the normal in 11, above in 8, and normal in 2. The deficits were not greatly in excess of the excesses, as will be seen by an examination of Table I. It is, perhaps, worthy of note that rainfall has been deficient in October in eight out of the last ten years. In only one year, 1890, was there an excess in a majority of districts.

In Canada.—Professor Stupart says:

Rainfall was below average throughout the Dominion, except in the small portion of Ontario over and contiguous to the Straits of Mackinaw, the whole of the Georgian Bay district, and a narrow strip of territory embracing the southern portions of Alberta and Assiniboia. Vancouver Island had 1.4 inch less than the usual amount; Lake Superior and southern Ontario, from 1 to nearly 2 inches, respectively; Quebec, from 1 to 2.5 inches; and the Maritime Provinces, the greatest amount below average, Grand Manan giving a deficiency of 4.1 inches; Halifax, 5 inches; St. John, 3.7 inches; and Fredericton, 3.1 inches.

The *years of greatest and least precipitation* for October are given in the REVIEW for October, 1890. The precipitation for the current month was the greatest on record at: Kittyhawk, 12.29; North Platte, 4.11; Concordia, 5.80; Wichita, 3.89. It was the least on record at: Eastport, 0.61; Portland, Me.,* 0.46; Boston,* 0.41; Nantucket, 1.63; Block Island, 1.83; Narragansett Pier, 1.23; Lexington, 0.38; Parkersburg, 0.07; Sandusky,* 0.43; Chicago,* 0.18; Davenport,* 0.35; Keokuk,* 0.24.

The *total accumulated monthly departures* from January 1 to the end of the current month are given in the second column of the following table; the third column gives the current accumulated precipitation expressed as a percentage of its normal value.

Districts.	Accumulated departures.	Accumulated precipitation.	Districts.	Accumulated departures.	Accumulated precipitation.
	Inches.	*Per ct.*		*Inches.*	*Per ct.*
Florida Peninsula	+11.00	124	New England	− 2.20	94
Middle Slope	+ 1.20	106	Middle Atlantic	− 4.60	88
Southern Slope	+ 0.80	104	South Atlantic	− 3.40	93
Southern Plateau	+ 4.20	158	East Gulf	− 4.60	90
Middle Plateau	+ 0.60	106	West Gulf	− 8.70	76
South Pacific	+ 1.70	120	Ohio Valley and Tenn	− 2.80	93
			Lower Lake	− 5.50	81
			Upper Lake	− 2.80	91
			North Dakota	− 1.10	94
			Upper Mississippi Valley	− 2.20	93
			Missouri Valley	− 3.20	88
			Northern Slope	− 1.20	91
			Northern Plateau	− 0 10	99
			North Pacific	− 5.40	87
			Middle Pacific	− 1.90	91

SNOWFALL.

The *total monthly snowfall* at each station, if any occurs, is

* Observations cover a period of over twenty-five years.

given in Tables I and II. The geographical distribution of snowfall is shown on Chart VI. It will be seen that no snow of any consequence fell, except on the Sierra Nevada, in the Great Basin, Wyoming, Colorado, and the western and northern parts of Nebraska.

In Canada, Prof. R. F. Stupart reports snow as follows:

British Columbia: Alberni, first snow on the 22d; Kelowna, snow low down on the hills. Assiniboia: Regina, very little rain or snow; Swift Current, slight snowstorm on the 10th. Ontario, near the Georgian Bay, snow fell in most places during the last few days of the month but was soon melted; in several eastern districts snow fell on or about the 29th; Fort William, some snow on the 29th. Maritime Provinces: Light snow fell at the end of the month.

HAIL.

The following are the dates on which hail fell in the respective States:

Alabama, 11. Arizona, 7, 9, 24. Arkansas, 9. California, 1, 14, 21, 23. Colorado, 3, 10, 13, 15, 16, 26, 27, 29, 30. Georgia, 9, 19. Idaho, 14. Illinois, 28. Indian Territory, 10. Kentucky, 10. Louisiana, 9, 11. Maryland, 22. Michigan, 5, 6. Mississippi, 11. Missouri, 10. Montana, 12, 25. Nevada, 1, 5, 6, 7, 8, 9, 13. New York, 21, 29. Oregon, 12, 13, 21. Pennsylvania, 22. South Carolina, 10. South Dakota, 10. Tennessee, 10. Utah, 1, 7, 9, 13, 25. Virginia, 22. Washington, 12, 13, 21.

SLEET.

The following are the dates on which sleet fell in the respective States:

Arizona, 15, 25, 26. Colorado, 15, 16, 25, 26. Kansas, 25, 26, 27. Michigan, 10, 29. Minnesota, 9, 10, 11, 16. Montana, 25. Nebraska, 16, 26, 27. Nevada, 3, 13, 24. New Mexico, 16, 27, 28, 29. New York, 29, 30. North Dakota, 9, 11, 13, 14, 25. Ohio, 30. South Dakota, 8, 9, 10, 15, 26, 27. Texas, 27, 28. Utah, 7, 15, 16, 24, 25. Washington, 13.

WIND.

The *prevailing winds* for October, 1897, viz, those that were recorded most frequently, are shown in Table I for the regular Weather Bureau stations.

Maximum wind velocities are given in Table I, which also gives the altitudes of Weather Bureau anemometers above the ground. Maxima of 50 miles or more per hour were reported during this month as follows (maximum velocities are averages for five minutes; extreme velocities are gusts of shorter duration, and are not given in this table):

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
		Miles				*Miles*	
Atlantic City, N.J	24	50	n.	Kittyhawk, N.C	20	60	n.
Do	25	53	ne.	Do	24	60	ne.
Block Island, R.I.	2	52	ne.	Do	25	54	nw.
Do	21	59	ne.	New York, N.Y	17	60	nw.
Fort Canby, Wash	19	70	se.	North Platte, Nebr	26	51	nw.
Do	20	68	se.	Pueblo, Colo	26	56	n.
Do	21	60	se.	Tatoosh Island, Wash.	21	54	s.
Do	22	60	e.	Do	22	55	e.
Do	23	76	se.	Do	23	50	e.
Hatteras, N.C	24	56	n.				

It will be seen by the table that the highest wind velocities observed during the month occurred at coast stations, except in two cases, viz: Pueblo, Colo., and North Platte, Nebr. The storm of which these winds were a special manifestation was rather widespread and severe. In Colorado and Wyoming business was generally suspended throughout the day, railroad trains moved with a great deal of uncertainty, snow was from 1 to 2 feet in depth and badly drifted, and street traffic in the larger cities was much impeded. The damage to telegraph and telephone wires in Denver alone is said to have been $25,000. The property loss elsewhere in the State of Colorado, where the storm seems to have been the most severe, was stated in the press dispatches to have been nearly $3,000,000.

The *resultant winds*, as deduced from the personal observations made at 8 a. m. and 8 p. m., are given in Table VIII. These latter resultants are also shown graphically on Chart IV, where the small figure attached to each arrow shows the number of hours that this resultant prevailed, on the assumption that each of the morning and evening observations represents one hour's duration of a uniform wind of average velocity. These figures indicate the relative extent to which winds from different directions counterbalanced each other.

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table IX, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

Thunderstorms.—The dates on which the number of reports of thunderstorms for the whole country were most numerous were: 10th, 145; 11th, 83; 12th, 56; 15th, 40.

Reports were most numerous from: Colorado, 46; Louisiana, 50; Nevada, 41; Texas, 45; Utah, 40.

Thunderstorm days were most numerous in: Colorado, 16; Louisiana and Utah, 12; Nevada, 13.

In Canada.—Thunderstorms were reported on the following dates: Halifax, 17; Father Point, 14; Ottawa, 8; Port Stanley, 7; Saugeen, 11, 16; Parry Sound, 5, 8, 11, 12, 20; Banff and Prince Albert, 1.

Auroras.—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four preceding and following the date of full moon, viz, from the 5th to the 13th, inclusive. On the remaining twenty-two days of this month 140 reports were received, or an average of about 6 per day. The dates on which the number of reports of auroras for the whole country especially exceeded this average were: 1st, 19; 27th, 43; 29th, 21.

Reports were most numerous from: Maine, 19; Nebraska, 20; New Hampshire, 15; North Dakota, 25.

The number of reports was a large percentage of the number of observers in: Maine, 136; New Hampshire, 107; North Dakota, 54.

In Canada.—Auroras were reported on the following dates: Halifax and Yarmouth, 1; Charlottetown, 27; Father Point, 1, 2, 19, 20, 25, 27, 29, 31; Quebec, 1, 2, 10, 17, 18, 27, 29; Montreal, 1; White River, 1, 30; Ottawa, 1, 29; Port Arthur, 28; Winnipeg, 27, 29; Minnedosa, 18, 29; Qu'Appelle, 27; Medicine Hat, 9, 27, 30; Swift Current, 15; Banff, 8, 18, 25; Prince Albert, 7; Battleford, 3, 23, 28.

SUNSHINE AND CLOUDINESS.

The quantity of sunshine, and therefore of heat, received by the atmosphere as a whole is very nearly constant from year to year, but the proportion received by the surface of the earth depends upon the absorption by the atmosphere, and varies largely with the distribution of cloudiness. The sunshine is now recorded automatically at 21 regular stations of the Weather Bureau by its photographic, and at 43 by its thermal effects; at one of these stations records are kept by both methods. The photographic record sheets show the apparent solar time, but the thermometric records show seventy-fifth meridian time; for convenience the results are all given in Table X for each hour of local mean time. In order to complete the record of the duration of cloudiness these

registers are supplemented by special personal observations of the state of the sky near the sun in the hours after sunrise and before sunset, and the cloudiness for these hours has been added as a correction to the instrumental records, whence there results a complete record of the duration of sunshine from sunrise to sunset.

The average cloudiness of the whole sky is determined by numerous personal observations at all stations during the daytime, and is given in the column "average cloudiness" in Table I; its complement, or percentage of clear sky, is given in the last column of Table X for the 64 stations at which instrumental self-registers are maintained.

COMPARISON OF DURATIONS AND AREAS.

The sunshine registers give the *durations* of effective sunshine whence the durations relative to possible sunshine are derived; the observers' personal estimates give the percentage of *area* of clear sky. These numbers have no necessary relation to each other, since stationary banks of clouds may obscure the sun without covering the sky, but when all clouds have a steady motion past the sun and are uniformly scattered over the sky, the percentages of duration and of area agree closely. For the sake of comparison, these percentages have been brought together, side by side, in the following table, from which it appears that, in general, the instrumental records of percentages of durations of sunshine are almost always larger than the observers' personal estimates of percentages of area of clear sky; the average excess for October, 1897, is 7 per cent for photographic and 6 per cent for thermometric records.

The details are shown in the accompanying table, in which the stations are arranged according to the *total possible* duration of sunshine, and not according to the *observed* duration. In obtaining the total possible sunshine the value for the parallel of latitude nearest the station is used.

Difference between instrumental and personal observations of sunshine.

Stations.	Latitude.		Apparatus.	For whole month.		Instrumental record of sunshine.			
				Total possible.	Personal.	Photographic.	Difference.	Thermometric.	Difference.
	°	'		Hrs.	%	%	%	%	%
Key West, Fla	24	34	T.	358.6	61	......	......	72	+11
Tampa, Fla	27	57	T.	356.3	66	......	......	69	+3
Galveston, Tex	29	18	P.	355.9	62	63	+1	......	......
New Orleans, La	29	58	T.	354.7	50	......	......	58	−1

Difference between instrumental and personal observations.—Cont'd.

Stations.	Latitude.		Apparatus.	For whole month.		Instrumental record of sunshine.			
				Total possible.	Personal.	Photographic.	Difference.	Thermometric.	Difference.
	°	'		Hrs.	%	%	%	%	%
Savannah, Ga	32	05	P.	352.8	52	58	+6	......	......
Vicksburg, Miss	32	22	T.	352.8	69	......	......	75	+6
San Diego, Cal	32	43	P.	351.5	80	79	+1	......	......
Charleston, S. C.	32	47	T.	351.5	45	......	......	46	+1
Phœnix, Ariz	33	28	P.	351.5	75	85	+10	......	......
Atlanta, Ga	33	45	T.	350.9	71	......	......	69	−2
Los Angeles, Cal	34	03	P.	350.9	64	70	+6	......	......
Wilmington, N. C.	34	14	T.	350.9	53	......	......	56	+3
Little Rock, Ark	34	45	T.	350.1	72	......	......	87	+15
Chattanooga, Tenn	35	04	T.	350.1	75	......	......	76	+1
Santa Fe, N. Mex	35	41	P.	348.9	60	66	+6	......	......
Raleigh, N. C.	35	45	T.	348.9	46	......	......	54	+8
Nashville, Tenn	36	10	T.	348.9	82	......	......	86	+4
Fresno, Cal	36	43	T.	347.9	72	......	......	76	+4
Dodge City, Kans	37	45	P.	347.3	63	70	+7	......	......
San Francisco, Cal	37	48	T.	347.3	56	......	......	70	+14
Louisville, Ky	38	15	T.	347.3	75	......	......	82	+7
St. Louis, Mo	38	38	T.	346.0	77	......	......	88	+11
Washington, D. C	38	54	P.	346.0	48	51	+3	......	......
Kansas City, Mo	39	05	P.	346.0	69	76	+7	......	......
Cincinnati, Ohio	39	06	T.	346.0	79	......	......	82	+3
Parkersburg, W. Va	39	16	T.	346.0	73	......	......	75	+2
Baltimore, Md	39	18	T.	346.0	46	......	......	52	+6
Atlantic City, N. J	39	22	P.	346.0	47	54	+7	......	......
Denver, Colo	39	45	P.	344.9	50	65	+15	......	......
Indianapolis, Ind	39	46	T.	344.9	71	......	......	81	+10
Philadelphia, Pa	39	57	T.	344.9	47	......	......	58	+11
Columbus, Ohio	39	58	T.	344.9	65	......	......	76	+11
Harrisburg, Pa	40	16	T.	344.9	45	......	......	59	+14
Pittsburg, Pa	40	32	T.	343.9	55	......	......	54	−1
New York, N. Y	40	43	T.	343.9	50	......	......	56	+6
Salt Lake City, Utah	40	46	P.	343.9	42	61	+19	......	......
Eureka, Cal	40	48	P.	343.9	51	54	+3	......	......
Cheyenne, Wyo	41	08	P.	343.9	54	65	+11	......	......
Omaha, Nebr	41	16	P.	343.9	56	65	+9	......	......
Cleveland, Ohio	41	30	T.	342.5	46	......	......	55	+9
Des Moines, Iowa	41	35	T.	342.5	60	......	......	61	+1
Chicago, Ill	41	53	T.	342.5	71	......	......	72	+1
Erie, Pa	42	07	T.	342.5	49	......	......	57	+8
Binghamton, N. Y	42	08	T.	342.5	53	......	......	61	+8
Detroit, Mich	42	20	T.	342.5	53	......	......	59	+6
Boston, Mass	42	21	T.	342.5	59	......	......	67	+8
Dubuque, Iowa	42	30	T.	342.5	72	......	......	69	−3
Albany, N. Y	42	39	T.	341.8	61	......	......	85	+24
Buffalo, N. Y	42	53	T.	341.8	37	......	......	56	+19
Rochester, N. Y	43	08	T.	341.8	41	......	......	42	+1
Idaho Falls, Idaho	43	29	T.	341.8	46	......	......	46	0
Yankton, S. Dak	42	54	T.	341.8	49	......	......	58	+9
Portland, Me	43	39	T.	340.5	62	......	......	74	+12
Northfield, Vt	44	10	P.	340.5	56	64	+8	......	......
Huron, S. Dak	44	21	T.	340.5	47	......	......	50	+3
Eastport, Me	44	54	P.	339.8	53	67	+14	......	......
St. Paul, Minn	44	58	P.	339.8	41	47	+6	......	......
Minneapolis, Minn	44	59	T.	339.8	......	......	......	36	......
Portland, Oreg	45	32	T.	338.5	56	......	......	58	+2
	45	32	P.	338.5	56	47	−9	......	......
Helena, Mont	46	34	P.	336.7	61	66	+5	......	......
Bismarck, N. Dak	46	47	P.	336.7	53	59	+6	......	......
Tacoma, Wash	47	16	T.	336.7	35	......	......	51	+16
Seattle, Wash	47	38	T.	335.8	46	......	......	31	−15
Spokane, Wash	47	40	T.	335.8	51	......	......	61	+10

CLIMATE AND CROP SERVICE.

By JAMES BERRY, Chief of Climate and Crop Service Division.

The following extracts relating to the general weather conditions in the several States and Territories are taken from the monthly reports of the respective sections of the Climate and Crop Service. The name of the section director is given after each summary.

Snowfall and rainfall are expressed in inches.

Alabama.—The mean temperature was 67.2°, or 4.2° above normal; the highest was 97°, at Goodwater on the 17th, and the lowest, 30°, at Newburg on the 24th and at Hamilton on the 29th. The average precipitation was 1.34, or 0.74 below normal; the greatest monthly amount, 5.00, occurred at Daphne, while none fell at Brewton, Goodwater, and Mount Willing.—*F. P. Chaffee.*

Arizona.—The mean temperature was 62.2°, or 2.9° below normal; the highest was 108°, at Texas Hill, and the lowest, 21°, at Fort Defiance on the 18th and at Fort Whipple on the 27th. The average precipitation was 0.47, or 0.22 below normal; the greatest monthly amount, 2.65, occurred at Williams, while none fell at several stations.—*W. T. Blythe.*

Arkansas.—The mean temperature was 67.7°, or 6.3° above normal; the highest was 99°, at Helena on the 3d, and the lowest, 28°, at Keesees Ferry on the 30th. The month was the warmest October on record. The average precipitation was 2.01, or 0.13 below normal; the greatest monthly amount, 5.36, occurred at Blanchard, and the least, 0.29, at Russellville.—*F. H. Clarke.*

California.—The mean temperature was 58.5°, or 2.6° below normal; the highest was 108°, at Salton on the 1st, and the lowest, 10°, at Bodie on the 16th. The average precipitation was 1.79, or 0.57 above normal; the greatest monthly amount, 7.85, occurred at Follows Camp.—*W. H. Hammon.*

Colorado.—The mean temperature was 47.0°, or 1.0° above normal; the highest was 93°, at Lamar on the 2d, and the lowest, 2° below zero, at Breckenridge on the 28th. The average precipitation was 2.07, or 1.17 above normal; the greatest monthly amount, 6.50, occurred at Santa Clara, and the least, 0.31, at Walden.—*F. H. Brandenburg.*

Florida.—The mean temperature was 72.4°, or 0.2° below normal; the highest was 95°, at Lake Butler on the 5th, 13th, and 15th, and the lowest, 40°, at Wausau on the 26th and 27th. The average precipitation was 4.61, or slightly below normal; the greatest monthly amount, 10.26, occurred at Sebastian, and the least, 0.25, at Wausau.—*A. J. Mitchell.*

Georgia.—The mean temperature was 66.0°, or 1.4° above normal; the highest was 91°, at Crescent on the 7th, and the lowest, 34°, at Ramsey on the 30th. The average precipitation was 2.61, or 0.12 below normal; the greatest monthly amount, 8.60, occurred at Fleming, and the least, 0.40, at Whitesburg.—*J. B. Marbury.*

Idaho.—The mean temperature was 46.1°; the highest was 92°, at Minidoka on the 9th, and the lowest, 4°, at Swan Valley on the 16th. The average precipitation was 1.77; the greatest monthly amount, 6.90, occurred at Kootenai, and the least, 0.14, at Warren.—*D. P. McCallum.*

Illinois.—The mean temperature was 60.3°, or 6.8° above normal, and was the warmest October on record; the highest was 98°, at Walnut on the 1st and at Alexander on the 2d, and the lowest, 20°, at Scales Mound on the 26th. The average precipitation was 0.49, or 2.35 below normal, and was the least recorded in any October; the greatest monthly amount, 1.64, occurred at Hallidayboro, and the least, 0.04, at Peoria.—*C. E. Linney.*

Indiana.—The mean temperature was 59.7°, or 6.5° above normal; the highest was 94°, at Mount Vernon on the 3d, 4th, and 6th, and at Bluffton on the 16th, and the lowest, 21°, at Cambridge City on the 30th. The average precipitation was 0.90, or 1.30 below normal; the greatest monthly amount, 3.68, occurred at Mauzy, and the least, 0.23, at Hammond.—*C. F. R. Wappenhans.*

Iowa.—The mean temperature was 56.8°, or 6.8° above normal; the highest was 97°, at Ottumwa on the 1st, and the lowest, 20°, at Plover on the 29th. The average precipitation was 1.14, or 1.64 below normal; the greatest monthly amount, 3.30, occurred at Thurman, and the least, 0.03, at North McGregor.—*G. M. Chappel.*

Kansas.—The mean temperature was 60.9°, or 5.4° above normal; the highest was 97°, at Atchison on the 3d, at Gibson on the 7th, and at Oswego on the 2d; the lowest, 22°, at Ulysses on the 24th and at Lakin on the 28th. The average precipitation was 2.39, or 0.73 above normal; the greatest monthly amount, 5.80, occurred at Concordia, and the least, 0.54, at Fort Scott.—*T. B. Jennings.*

Kentucky.—The mean temperature was 63.2°, or 7.2° above normal, and was the warmest October on record; the highest was 96°, at Russellville and Greensburg on the 1st and at Shelby City on the 15th; the lowest was 26°, at Greensburg and Marrowbone on the 30th. The average precipitation was 1.10, or 0.91 below normal; the greatest monthly amount, 4.26, occurred at Ensor, and the least, 0.07, at Sergent.—*Frank Burke.*

Louisiana.—The mean temperature was 71.0°, or 4.2° above normal, and was the warmest October on record; the highest was 98°, at Liberty Hill on the 3d, and the lowest, 38°, at Como on the 31st and at Robeline on the 29th and 30th. The average precipitation was 3.48, or 0.86 above normal; the greatest monthly amount, 6.69, occurred at Jeanerette, and the least, 0.95, at Amite.—*R. E. Kerkam.*

Maryland and Delaware.—The mean temperature was 56.6°, or 2.4° above normal; the highest was 91°, at Taneytown, Md., on the 16th, and the lowest, 20°, at Sunnyside, Md., on the 31st. The average precipitation was 3.21, or 0.20 above normal; the greatest monthly amount, 8.17, occurred at Millsboro, Del., and the least, 0.55, at Grantsville, Md.—*F. J. Walz.*

Michigan.—The mean temperature was 52.2°, or 5.5° above normal, and was the warmest October on record; the highest was 93°, at Waverly on the 5th, and the lowest, 18°, at Iron River on the 29th. The average precipitation was 2.34, or 0.01 above normal; the greatest monthly amount, 4.69, occurred at East Tawas, and the least, 0.23, at Allegan.—*C. F. Schneider.*

Minnesota.—The mean temperature was 50.0°, or 4.9° above normal; the highest was 92°, at Milan on the 1st, and the lowest, 10°, at Tower on the 9th. The average precipitation was 1.55, or 0.31 below normal; the greatest monthly amount, 3.35, occurred at Le Sueur, and the least, 0.15, at Wilmar.—*T. S. Outram.*

Mississippi.—The mean temperature was 69.0°, or 3.8° above normal; the highest was 99°, at Brookhaven and Yazoo City on the 7th, and the lowest, 30°, at Aberdeen on the 30th. The average precipitation was 1.85, or 0.97 below normal; the greatest monthly amount, 3.88, occurred at Briers, and the least, 0.35, at Waynesboro.—*R. J. Hyatt.*

Missouri.—The mean temperature was 62.6°, or 7.1° above normal, and was the warmest October on record; the highest was 99°, at Maryville on the 14th, and the lowest, 23°, at Potosi on the 30th. The average precipitation was 0.72, or 1.85 below normal; the greatest monthly amount, 1.84, occurred at Sikeston, while none fell at Darksville.—*A. E. Hackett.*

Montana.—The mean temperature was 41.1°, or nearly 2.0° above normal; the highest was 93°, at Glendive on the 1st, and the lowest, 10°, at Kipp on the 26th. The average precipitation was 1.25; the greatest monthly amount, 2.92, occurred at Bozeman, and the least, trace, at Wibaux.—*J. Warren Smith.*

Nebraska.—The mean temperature was 53.5°, or 3.3° above normal; the highest was 98°, at Rulo on the 14th, and the lowest, 16°, at Kimball on the 31st. The average precipitation was 3.34, or 1.75 above normal; the greatest monthly amount, 8.33, occurred at Sutton, and the least, trace, at Fort Robinson.—*G. A. Loveland.*

Nevada.—The mean temperature was 47.1°, or 3.1° below normal; the highest was 95°, at St. Thomas on the 1st, and the lowest, 9°, at Hamilton on the 15th and 16th. The average precipitation was 1.71, or 1.24 above normal; the greatest monthly amount, 4.41, occurred at Lewer's Ranch, and the least, 0.08, at Hot Springs.—*R. F. Young.*

New England.—The mean temperature was 50.1°, or 1.9° above normal; the highest was 91°, at Lake Cochituate, Mass., on the 16th, and the lowest, 12°, at West Milan, N. H., on the 31st. The average precipitation was 1.10, or 2.84 below normal; the greatest monthly amount, 2.44, occurred at Vineyard Haven, Mass., and the least, 0.15, at Newton, N. H.—*J. W. Smith.*

New Jersey.—The mean temperature was 55.8°, or 2.5° above normal; the highest was 95°, at Somerville on the 16th, and the lowest, 22°, at Charlotteburg on the 31st. The average precipitation was 2.43, or 1.15 below normal; the greatest monthly amount, 6.49, occurred at Cape May City, and the least, 0.87, at Englewood.—*E. W. McGann.*

New Mexico.—The mean temperature was 55.6°, or 1.5° below normal; the highest was 90°, at Los Lunas on the 8th and at Roswell on the 14th, and the lowest, 3°, at Winsor's on the 28th. The average precipitation was slightly above normal; the greatest monthly amount, 6.43, occurred at Fort Union, and the least, 0.20, at Eddy.—*H. B. Hersey.*

New York.—The mean temperature was 51.6°, or 3.2° above normal; the highest was 90°, at Willets Point on the 1st and at West Point on the 17th, and the lowest, 17°, at Canton on the 30th and 31st. The average precipitation was 0.88, or 2.57 below normal; the greatest monthly amount, 2.38, occurred at Number Four, and the least, 0.13, at Poughkeepsie.—*R. M. Hardinge.*

North Carolina.—The mean temperature was 62.2°, or 2.8° above normal; the highest was 94°, at Salisbury on the 2d, and the lowest, 23°, at Linville on the 5th. The average precipitation was 3.99, or 0.44 above normal; the greatest monthly amount, 12.24, occurred at Kittyhawk, and the least, 0.55, at Selma.—*C. F. von Herrmann.*

North Dakota.—The mean temperature was 45.9°, or 3.5° above normal; the highest was 93°, at Minot on the 1st and at Williston on the 12th, and the lowest, 6°, at Dickinson and Minto on the 9th. The average precipitation was 0.77, or 0.19 below normal; the greatest monthly amount, 2.50, occurred at Wahpeton, and the least, 0.05, at Berthold Agency.—*B. H. Bronson.*

Ohio.—The mean temperature was 58.1°, or 6.4° above normal, the warmest October on record; the highest was 97°, at New Paris and Thurman on the 1st, and the lowest, 20°, at Levering on the 8th and 30th, and at McArthur on the 30th. The average precipitation was 0.64, or 1.62 below normal, the driest month on record; the greatest monthly amount, 2.78, occurred at Hiram, while none fell at New Alexandria.—*H. W. Richardson.*

Oklahoma.—The mean temperature was 65.7°; the highest was 99°, at Wagoner on the 17th, and the lowest, 28°, at Mangum and Tahlequah on the 29th. The average precipitation was 1.37; the greatest monthly amount, 2.73, occurred at Fort Sill, and the least, 0.34, at Edmond.—*J. I. Widmeyer.*

Oregon.—The mean temperature was 51.6°, or 0.4° below normal; the highest was 94°, at Langlois on the 5th; this is the first time since the establishment of the service in Oregon that the thermometer ever rose to 94° in October. The average precipitation was 1.92, or 1.82 below normal; there was a deficiency in all districts; the greatest monthly amount, 8.18, occurred at Langlois, while none fell at Fife.—*B. S. Pague.*

Pennsylvania.—The mean temperature was 54.2°, or 4.1° above normal; the highest was 95°, at Cannonsburg on the 15th, and at Aqueduct on the 16th, and the lowest, 16°, at Shingle House on the 18th. The average precipitation was 1.32, or 1.91 below normal; the greatest monthly amount, 5.93, occurred at Reading, and the least, trace, at Greensboro.—*T. F. Townsend.*

South Carolina.—The mean temperature was 65.8°, or 1.8° above normal; the highest was 96°, at Little Mountain on the 2d, and the lowest, 35°, at Holland on the 30th. The average precipitation was 3.23, or 0.13 above normal; the greatest monthly amount, 7.04, occurred at Charleston, and the least, 1.20, at Effingham.—*J. W. Bauer.*

South Dakota.—The mean temperature was 50.0°, or 2.0° above normal; the highest was 96°, at Oelrichs on the 7th, and the lowest, 6°, at Cherry Creek on the 31st. The average precipitation was 1.24, or 0.25 above normal; the greatest monthly amount, 3.15, occurred at Plankinton, and the least, trace, at Cherry Creek and Nowlin.—*S. W. Glenn.*

Tennessee.—The mean temperature was 63.6°, or 5.5° above normal; the highest was 97°, at Sylvia on the 3d, and the lowest, 25°, at Erasmus on the 30th. The average precipitation was 1.61, or about 0.50 below normal; the greatest monthly amount, 4.20, occurred at Harriman, and the least, 0.10, at Union City.—*H. C. Bate.*

Texas.—The mean temperature for the State was 2.4° above the normal. There was a general excess in all sections, except in the vicinity of Cuero, El Paso, and Mount Blanco, where there was a slight deficiency, with the greatest, 2.3° at the latter place. The excess for the month ranged from 0.5° to 4° over north Texas and the panhandle;

from 0.2° to 5.1° over central, east, and southwest Texas, and from 0.3° to 4.7° over the coast district. The greatest excess was 5.1° at Waco. The highest was 102°, at Camp Eagle Pass on the 12th, and the lowest, 27°, at Amarillo and Mount Blanco on the 28th. The average precipitation for the State was 1.01 above the normal. There was a general excess, ranging from 0.25 to 7.77, over east Texas, the eastern portions of central and southwest Texas, the coast district, and the central portion of north Texas and the panhandle, while there was a general deficiency over the other portions of the State, ranging from 0.22 to 2.03 over the west and east portions of north Texas, the western portions of central and southwest Texas and coast district, and over west Texas, except in the vicinity of El Paso, where there was a slight excess. The greatest excess was 7.77 at Brazoria and the greatest deficiency was 2.03 in the vicinity of Brownsville. The rainfall was well distributed through the month, but was generally irregular over the State, being excessive in some localities, while there was very little in others. The greatest monthly amount, 10.23, occurred at Brazoria, while none fell at Camp Eagle Pass.—*I. M. Cline.*

Utah.—The mean temperature was 47.8°; the highest was 86°, at Cisco on the 9th, and the lowest, 7°, at Loa on the 26th. The average precipitation was 2.18; the greatest monthly amount, 3.76, occurred at Pinto, and the least, 0.28, at Park City.—*J. H. Smith.*

Virginia.—The mean temperature was 59.0°, or 1.6° above normal; the highest was 97°, at Buckingham on the 16th, and the lowest, 25°, at Burkes Garden on the 31st. The average precipitation was 4.26, or 1.09 above normal; the greatest monthly amount, 9.64, occurred at Spottsville, and the least, 0.34, at Swords Creek.—*E. A. Evans.*

Washington.—The mean temperature was 49.8°, or 0.3° below normal; the highest was 90°, at Centerville on the 7th, and the lowest, 19°, at Centerville and Lind on the 15th. The average precipitation was 1.55, or 1.23 below normal; the greatest monthly amount, 4.55, occurred at Lapush, and the least, 0.07, at Dayton.—*G. N. Salisbury.*

West Virginia.—The mean temperature was 58.2°, or about 6.0° above normal; the highest was 95°, at Beverly on the 16th, and the lowest, 22°, at Marlinton on the 31st. The average precipitation was 0.53; the greatest monthly amount, 2.27, occurred at Harpers Ferry, and the least, 0.07, at Charleston.—*H. L. Ball.*

Wisconsin.—The mean temperature was 52.7°, or 5.1° above normal, and was the warmest October on record; the highest was 95°, at Gratiot on the 14th, and the lowest, 15°, at Wausaukee on the 17th. The average precipitation was 1.54, or 0.43 below normal; the greatest monthly amount, 3.93, occurred at Crandon, and the least, 0.27, at Viroqua.—*W. M. Wilson.*

Wyoming.—The mean temperature was 45.1°, or 0.7° below normal; the highest was 85°, at Fort Laramie on the 1st, and the lowest, 6° below zero, at Atlantic City on the 26th. The average precipitation was 1.04, or 0.28 above normal; the greatest monthly amount, 1.94, occurred at Wise, and the least, 0.21, at Lusk.—*J. B. Sloan.*

RIVER AND FLOOD SERVICE.

By PARK MORRILL, Forecast Official, in charge of River and Flood Service.

This is the time of year at which the rivers normally reach their lowest ebb. The fall has continued to the end of the month, except in the Ohio and Tennessee, which have, perhaps, taken a lasting turn toward higher water, to be soon followed by the lower Mississippi. The slight rise at New Orleans must be attributed to the effect of the Gulf tide or of wind, as the fall has been steady and pronounced at Vicksburg, and also in the Red River. It may be noted that the river stages at New Orleans during September, as well as the past month, were subject to irregular changes, which are not shown at higher stations on the Mississippi or in the Red River. The tidal effect from the Gulf is felt, in very low water, as far up the Mississippi as the mouth of the Red.

All the rivers of the Mississippi system have reached lower stages this month than are usual in their annual decline. It is, perhaps, not strange that the great flood of the spring, arising from an excessive rainfall, should be followed by a period of light rains and abnormally low water in the rivers. At all events, the Mississippi throughout its length, with the exception of the lower 100 or 200 miles, is below its normal lowest stage by 2 or 3 feet.

The highest and lowest water, mean stage, and monthly range at 117 river stations are given in the accompanying table. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are: Keokuk, St. Louis, Cairo, Memphis, and Vicksburg, on the Mississippi; Cincinnati, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.

The following résumé of river stages and conditions of navigation in the respective streams is compiled from reports by the officials of the Weather Bureau at various river stations and section centers:

Atlantic Coast Rivers. (Reported by A. F. Sims, Albany, N. Y.; E. R. Demain, Harrisburg, Pa.; E. A. Evans, Richmond, Va.; C. F. von Herrmann, Raleigh, N. C.; L. N. Jesunofsky, Charleston, S. C.; D. Fisher, Augusta, Ga.; and J. B. Marbury, Atlanta, Ga.)—The volume of water flowing in the Hudson River past Albany suffered a daily decrease from the 1st to the 18th, when it fell to the lowest point reached so far this season. On the 18th the Bath and Rensselaer boats struck bottom several times on their trips, and they found it necessary to seek the dock above Bath for landing, to insure safety. Except where the channels have been cut out, the water in the Albany basin was but 2 feet deep, and in many places the bottom was bare. A fall of 4 feet was experienced during the first two decades of October. The lowest stage ever recorded at the head of tidewater was reached on Sunday, the 17th. The Troy ferryboat was obliged to stop running, and some deep-draught tugboats had to put out guy lines to prevent them from capsizing. The tug *Crandell*, with a tow of six canal boats, was stranded in the middle of the river, near the Congress street bridge, on the 17th. More than the normal amount of fog prevailed over the Hudson River during the month, the heaviest occurring on the morning of the 27th. Night boats and tows were greatly delayed, and the loss to shippers by missing trains, because of the delay of the boats, is quite an important item. The close of the month still finds a low stage of water in the Hudson.

The drought, which prevailed during the greater part of the month, affected the flow of water in all streams of the Susquehanna River system, but not so much as dry periods in some previous years, especially in the lower river. In 1895, with a rainfall of 1.63 inch at Harrisburg, the river stage averaged 0.3 foot in October, while during the past month, with a rainfall of only 1.35 inch, the average stage was 0.9 foot. The river averaged much lower, however, than during the same period last year, but the rainfall was less, averaging only about 36 per cent of the amount that fell during October, 1896. Seventeen reporting stations gave an average rainfall of 3.70 inches in October, 1896, while for October, 1897, the average for the same number of stations was 1.35 inch. The average river gauge readings of 16 stations in October, 1896, was 2.5 feet, and in 1897 less than 0.2 foot. At Renovo, Cameron, Cedar Run, Sinnemahoning, and Wilkesbarre, the water was at or below zero of the gauges during the whole month. At Lockhaven the river fell to zero on the 5th, and at East Bloomsburg it reached zero on the 9th, remaining at or below that point at both stations during the rest of the month. The highest stages for the month prevailed, as usual, in the Juniata; the stage at Huntingdon averaged 2.8 feet, and at Mifflin, 1.6 foot.

Owing to the extremely dry weather of the first and part of the second decade of the month, the James River continued at an unusually low stage, the readings being below the zero of the gauge. During this time the falls of the river at this point could be crossed without wetting the feet. During the last decade rains were abundant and long continued, and, under their influence, the river rose slowly to a maximum of 1.0 foot. Under ordinary circumstances the amount of rainfall which occurred over the basin would have produced a freshet, but the ground being very dry and the rain falling steadily, the greater quantity of it was absorbed before entering the stream.

The stages of the rivers throughout North Carolina continued unusually low during the month of October. During the first decade even lower gauge readings were recorded than during September. A stage of —0.1 foot was reached at Clarksville on the Dan, and 0.2 foot at Fayetteville on Cape Fear. The drought was finally broken by copious rains during the last decade, but the rainfall had remarkably little effect on the rivers, causing a rise of barely two feet in the larger streams, which continued much below the average stage at the end of the month. The first boat, since September 27, passed from Wilmington to Fayetteville on October 26. Salt water was reported farther upstream than usual, reaching, for example, to Vanceboro, a village 24 miles above Newbern.

The river basins of South Carolina were entirely rainless from September 23 to October 10, and, in consequence, the streams receded to

exceptionally low stages. Navigation on the Wateree, the lower Pedee, the Lynch, the Little Pedee, the Black, and the Santee was suspended from the 1st to the 13th, and from the 28th to the 31st. The water was too low in the Congaree for steamers to reach Granby Falls, the head of navigation. There was no traffic on the upper Pedee during the month, although the stream at Cheraw rose and declined rapidly on the 14th and 15th, respectively. The Lumber, at Fairbluff, was below the zero of gauge from the 1st to the 24th, reaching its lowest stage, —0.8 foot, on the 11th to 13th, and falling below the stage of October 20 and 21, 1895, by 0.5 foot. The Santee, at St. Stephens, was below the zero of gauge from the 5th to 13th, the lowest reading recorded being —1.3 foot, or 0.1 foot higher than the readings of September 20-22.

The great lack of rainfall caused Winyah Bay and the extreme lower portions of the Pedee, Waccamaw, and Black rivers, for several miles upstream, to become brackish from the 1st to the 13th. The rice planters were unable to use any of the river water during that period on their June, or late, rice, for fear of blasting it. Many sawmills, located on upper Winyah Bay and the lower Pedee and Waccamaw rivers, were compelled to suspend operations on account of the brackishness of the water, which ruins boilers. This encroachment of salt water so far inland has not occurred in seven years. The mill men have begun digging wells, varying in depth from 200 to 500 feet, and, if successful, will be entirely independent of river water. It is stated, upon good authority, that the limit of salt water in the streams this year exceeds, by some 4 miles, that of the past thirty-five years. The suspension of navigation on most of the streams for nearly three weeks crippled steamboat interests to a great extent. It is estimated that the loss foots up to $90,000. For the month of September cotton receipts, by way of the rivers, were but little over 11,200 bales, or 60 per cent of what they usually are, and during October the amount was slightly less. Much cotton was transported long distances to railroad stations, since it could not be sent by water. Conditions were somewhat modified by moderate showers over the northern section of this State and the central portion of North Carolina on the 10th to 12th, which caused a 10-foot rise at Camden and a 11-foot rise at Cheraw on the 14th, and afforded steamboat water on the Santee, the Wateree, the lower Black, the lower Pedee, the Lynch, and the Little Pedee rivers from the 14th to the 27th. The Edisto remained at a fair steamboat stage throughout the month, but, owing to numerous snags, there was little navigation upon it. Navigation up the Waccamaw, from Winyah Bay to Conway, was uninterrupted, and traffic was somewhat increased by the heavy shipments of cotton and naval stores.

The rainfall for the month in the Savannah watershed, while of an average amount, was not sufficient for full navigation. There was practically no rain during the first decade, which necessitated a tie-up of the river boats in use at this season. After the 11th there were two small rises, one occurring in the second decade and the other in the third, which contributed toward a partial restoration of river traffic. Taking it all in all the extreme shallowness of the river made navigation for October decidedly unprofitable.

The protracted drought was temporarily broken by one or two good rains, but most of the water which fell was taken up by the soil, so that little or no effect was felt in the Georgia streams. Low water continues at all stations, and the rivers are below the boating stage. At Columbus, Ga., several steamers are stranded, and can not move until lifted by a rise in the river.

Mobile River and branches. (Reported by F. P. Chaffee, Montgomery, Ala., and W. M. Dudley, Mobile, Ala.)—The rainfall during the month was light and widely scattered, and insufficient to cause any material rise in the Alabama River and its tributaries during the entire month, and the very low waters which prevailed caused an entire suspension of river traffic. In the larger streams the water was below the gauge zeros all the month, and at Selma, Ala., it remained 2 feet below zero from the 1st to the 19th, inclusive.

The beginning of October found the Tombigbee River and its tributaries with little water in them, all places reporting the stage below the zero of gauge. Very little precipitation occurred during the month. A heavy shower fell at Columbus, Miss., on the 12th, but made no material change in the river. The low stage of water continued to the close of the month. Navigation was seriously retarded by the severe quarantine regulations established by the different counties. During the latter part of the month the restrictions were modified, but, owing to the low stage of the rivers, boats were unable to proceed more than 60 to 65 miles from Mobile.

Ohio River and branches. (Reported by F. Ridgway, Pittsburg, Pa.; H. L. Ball, Parkersburg, W. Va.; S. S. Bassler, Cincinnati, Ohio; F. Burke, Louisville, Ky.; P. H. Smyth, Cairo, Ill.; L. M. Pindell, Chattanooga, Tenn.; and H. C. Bate, Nashville, Tenn.)—Navigation on the upper Ohio and the rivers of West Virginia was suspended throughout the month. The Ohio and the two Kanawhas held such low stages that ferryboats at some points found it difficult to make crossings. In many parts of West Virginia the smaller rivers were nearly dry, and some actually ceased running. The stage at Parkersburg ranged from 2.6 feet on the 1st to 0.9 foot during the closing days of the month. Curiously enough, a traction engine was reported to have forded the Ohio near Ravenswood without having its fire extinguished, the river being so low.

At Cincinnati there was practically no change in the river situation during the month of October, very low water with slight and unimportant variations prevailing the entire month. A slight rise in the Great Kanawha on the 13th and 14th afforded an opportunity to take empty coal barges to the mines. The highest stage at Cincinnati in October was 4.2 feet on the 20th, the lowest 3.0 feet during the evening of the 26th. River business has been practically at a standstill during the month.

At Louisville the stage of water fluctuated but very little, preserving an average depth of 4 feet. This precluded navigation by all except the smaller boats. The lighter packets of the Cincinnati Mail Line continued to run throughout the month. At Evansville and Paducah the river was practically at a stand the entire month; at Evansville the stage varied only 0.6 foot during the month, while at Paducah the range was only 0.5 foot. At Cairo the river fell 0.1 foot per day during the first decade, but from the 10th to the 31st it was practically stationary. The long-continued low stage of the river is seriously interfering with navigation, it being possible to conduct it only in a small way. All steamers from Cairo to the upper Ohio have been abandoned. The Cairo and Paducah Packet continued running, but it was necessary to put on a light-draught steamer. Usually at this time of the year a moderate rise is looked for out of the Ohio, and rivermen are now anxiously looking forward to its expected coming.

The Tennessee River remained low during the entire month, rendering navigation impossible; on October 20 a light-draught boat tried to make a trip from Chattanooga to Kingston during the slight rise that occurred, but the trip was unsuccessful, as the boat on her return trip could not pass over the bars. The highest stage the river reached during the month, from Riverton, Ala., to Speers Ferry, Va., was 2.4 feet at Clinton, Tenn. The river was below the zero of the river gauge the entire month at Speers Ferry and Riverton; from the 1st to 18th at Florence, Ala.; and from the 7th to 20th at Knoxville, Tenn. The rainfall was slightly below the normal over the river system, but at Chattanooga it was slightly in excess.

On the Cumberland River navigation was closed all the month. The stage of the river ranged from a maximum of 0.4 at Nashville to a minimum of —0.7 foot at Burnside. The month closed with rain falling, but not enough is expected to materially affect river conditions.

Mississippi River and branches, except the Ohio. (Reported by P. F. Lyons, St. Paul, Minn.; M. J. Wright, Jr., La Crosse, Wis.; G. E. Hunt, Davenport, Iowa; F. Z. Gosewisch, Keokuk, Iowa; H. C. Frankenfield, St. Louis, Mo.; P. H. Smyth, Cairo, Ill.; S. C. Emery, Memphis, Tenn.; R. J. Hyatt, Vicksburg, Miss.; R. E. Kerkam, New Orleans, La.; L. A. Welsh, Omaha, Nebr.; P. Connor, Kansas City, Mo.; F. H. Clarke, Little Rock, Ark.; J. J. O'Donnell, Fort Smith, Ark.; and C. Davis, Shreveport, La.)—There is little of consequence to be said about the rivers of Minnesota during the month of October, 1897. The wharf at St. Paul remained completely deserted, inasmuch as navigation remained suspended, although the stage of water, as indicated by the gauge, was much higher than that of any other October since 1881; it was 4.9 feet on the 1st, and gradually declined to 3.8 feet on the 31st.

At La Crosse the stage of water in the Mississippi River averaged nearly half a foot lower than during the preceding month. No packets were running during the month, but rafting, although light, was unusually good for the season. The water was highest at the beginning and ending of the month, and was lowest from the 16th to the 22d.

Except at Red Wing, Minn., where 4.51 inches of rain fell, there was a deficiency in rainfall at all stations on the upper Mississippi. At North McGregor, Iowa, 0.03 inch of rain made up the sum for the entire month. Except at St. Paul the stage remained practically stationary at all stations. The water was not high enough for the larger boats, but the smaller local packets ran to Davenport the entire month without inconvenience. Some rafting was still going on at the end of October.

At Keokuk the river fell very slowly from the 1st to the 19th, and since then has remained stationary at the lowest stage of the season, 1.2 foot. Navigation is confined to light-draught steamboats, carrying but partial loads, and boats, towing lumber and log rafts.

At St. Louis low stages continued throughout the month, with a fall of about 1 foot south of Grafton. Navigation is impossible except for boats of very light draught, and of these a few are still running on the upper Mississippi, and one between St. Louis and Peoria on the Illinois River.

The Mississippi, between St. Louis and Cairo, has been at a stand or falling slowly during the entire month. The low stage of water has compelled the laying up of the St. Louis and Tennessee River packets. All regular boats have been laid up, and navigation is being carried on only in a small way. The St. Louis and Mississippi Valley Transportation Company have tows at Point Pleasant, Mo., and Memphis, Tenn., bound for southern points, which have, on account of low water, been tied up since the latter part of September. This company has also eight barges at Cairo waiting for a rise in the river before they can be gotten out. The Anchor Line steamer *Mary Morton*, which was sunk near Chester, Ill., on October 1, is reported a total wreck.

Between Cairo and Helena there was a steady fall up to the 24th, upon which date the gauge reading at Memphis was 0.3 foot, and that low stage was maintained until the end of the month. The monthly

average stage was 4.5 feet below normal. While lower stages have occurred in former years, notably in 1894 and 1895, not for a number of years have so many casualties been reported as during the present season, most of which were caused by boats coming in contact with snags and other obstructions, where the water was shallow. Just at this season of the year traffic is generally heavier than at any other time, on account of the movement of the cotton crop, but this season, owing to the low water and the quarantine restrictions combined, river business has been light, and many of the large boats were laid up during a greater part of the month.

From Helena to Vicksburg the stage of water continued low throughout the month, falling below zero on the gauge at Helena on the 15th, at Greenville on the 13th, and at Vicksburg on the 3d. The Yazoo River was below the gauge zero at Yazoo City the entire month, and the mouth of the Yazoo is still closed to navigation by the sandbar. The low stages of water and the quarantine regulations continued to restrict river traffic, at a great loss to river interests at this time, when, usually, river business is very active in transporting cotton, cotton seed, corn, and plantation supplies generally. The bulk of the crops has been gathered, and is awaiting shipment to market.

The Mississippi, below Vicksburg, continued at a low stage the entire month, there being a general, slight, and gradual decline between Vicksburg and New Orleans from the opening to the closing days. The stage at and below New Orleans was subject to fluctuations due to change of winds, and a backing up of the waters from the Gulf. Green sea water was observed as far up as New Orleans, and salt water fish were caught along the river front. Numerous points along the rivers quarantined against New Orleans, owing to the prevalent yellow fever, and there was but little traffic on the rivers during the entire month.

The stage of water in the Missouri River above Kansas City, continued low and steady throughout the month. The entire range of gauge readings at Omaha was only 0.2 foot, the stage being the same at the close of the month as at the opening; the range at Kansas City was 0.6 foot. The unusually low water was the only interesting feature in connection with the river during the month.

The Arkansas River at Fort Smith and westward remained below a navigable stage during the month, and fell steadily at Fort Smith from 1.1 foot on the 1st to 0.6 on the 31st, this being the lowest stage since January 1, 1895. With the exception of a slight rise at Little Rock on the 11th, the lower Arkansas River declined steadily throughout the month, reaching its minimum stage of —0.7 foot at Dardanelle on the 29th, and 1.0 foot at Little Rock on the 26th. This is the lowest stage recorded at Little Rock since January 16, 1881, when the stage was 0.8 foot. Navigation was suspended between Fort Smith and Pinebluff during the entire month, and the river was so low between Pinebluff and the mouth that heavily laden boats could ascend the river only to a point 8 miles below Pinebluff, where freight had to be unloaded and transported overland.

The Red River was devoid of notable features during the month; little or no rain fell, and the readings were low throughout the length of the river. From Shreveport southward, the stages were below the gauge zeros the entire month.

Rivers on the Pacific Coast. (Reported by W. H. Hammon, San Francisco, Cal.; J. A. Barwick, Sacramento, Cal.; and B. S. Pague, Portland, Oreg.)—The rivers of California remained about stationary until the 22d, when there was a slight rise until the 25th, owing to the rains on the 21st to 23d. They then began to fall and continued falling until the end of the month, when they were at about the same stage as on the 1st. The Sacramento River at Sacramento has ranged between 10.0 and 8.3 feet. Navigation has not been obstructed.

During the month the Columbia, Willamette, Snake, and tributary rivers were at the low-water stage common at this season of the year. The river steamers on the Columbia from The Dalles westward, on the Willamette northward, on the Snake from Lewiston westward, had sufficient water for navigation, and the crops have been moved readily to tidewater.

Heights of rivers above zeros of gauges, October, 1897.

Stations.	Distance to mouth of river.	Danger line on gauge.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Mississippi River.	*Miles*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
St. Paul, Minn.	1,957	14	4.9	1	3.8	30, 31	4.2	1.1
Reeds Landing, Minn.	1,887	12	3.1	26-28	2.2	18, 19	2.6	0.9
La Crosse, Wis.	1,822	10	4.1	28, 29	3.2	22	3.6	0.9
North McGregor, Iowa	1,762	18	3.4	30, 31	2.5	18, 21	2.9	0.9
Dubuque, Iowa	1,702	15	3.3	31	2.5	20, 21	2.8	0.8
Leclaire, Iowa	1,612	10	1.9	1-3	1.3	23-26	1.5	0.6
Davenport, Iowa	1,596	15	2.9	1, 2	2.2	18, 19; 22-27	2.4	0.7
Keokuk, Iowa	1,466	14	1.8	1, 7	1.2	19-31	1.4	0.6
Hannibal, Mo	1,405	17	2.8	1-4	1.9	28-31	2.3	0.9
Grafton, Ill	1,307	23	3.6	1, 2	2.8	28-31	3.1	0.8
St. Louis, Mo.	1,264	30	3.9	1, 2	2.8	22-26	3.2	1.1
Chester, Ill.	1,189	30	2.5	1, 2	1.5	23-31	1.9	1.0
Cairo, Ill	1,073	40	3.6	1	2.5	20-29	2.8	1.1
Memphis, Tenn	843	33	1.6	1	0.2	30	0.7	1.4
Mississippi River—Cont'd	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Helena, Ark	767	44	1.2	1, 2	− 0.8	26-29	0.0	2.0
Arkansas City, Ark.	635	42	− 0.1	1	− 2.3	27-31	−1.4	2.2
Greenville, Miss	595	40	0.8	1	− 1.2	30	−0.3	2.0
Vicksburg, Miss	474	41	0.2	1	− 2.9	31	−1.5	3.1
New Orleans, La	108	16	4.5	1	2.6	25, 26	3.5	1.9
Arkansas River.								
Wichita, Kans.	720	10	1.1	1-5	0.8	29-31	1.0	0.3
Fort Smith, Ark.	345	22	1.1	1	0.6	27-31	0.8	0.5
Dardanelle, Ark.	250	21	− 0.1	1-3	− 0.7	29-31	−0.5	0.6
Little Rock, Ark.	170	23	2.0	1	1.0	26-31	1.5	1.0
White River.								
Newport, Ark	150	26	0.2	1-10; 18-31	0.1	11-17	0.2	0.1
Des Moines River.								
Des Moines, Iowa	150	19	3.8	18-20, 29	3.0	1-10	3.4	0.8
Illinois River.								
Peoria, Ill	135	14	3.8	16-18; 20-31	3.7	1-15, 19	3.7	0.1
Missouri River.								
Bismarck, N. Dak.	1,201	14	2.2	28-31	1.7	9-13	1.9	0.5
Pierre, S. Dak.	1,006	14	1.1	22, 28-31	0.6	14-18	0.9	0.5
Sioux City, Iowa	676	19	5.6	31	4.9	6	5.0	0.7
Omaha, Nebr.	561	18	4.9	1, 19-21; 31	4.7	6-15; 26-30	4.8	0.2
St. Joseph, Mo.	373	10	0.6	24	− 0.2	10, 11	0.2	0.8
Kansas City, Mo.	280	21	5.2	11, 12	4.6	7	5.0	0.6
Boonville, Mo.	191	20	4.6	1	3.8	16-20	4.1	0.8
Hermann, Mo.	95	21	− 0.8	1	− 1.6	18-23	−1.3	0.8
Ohio River.								
Pittsburg, Pa	966	22	6.0	1	5.3	7, 8	5.6	0.7
Davis Island Dam, Pa.	960	25	2.1	1	1.2	12	1.5	0.9
Wheeling, W. Va.	875	36	2.1	1	0.4	28-31	7.8	1.7
Parkersburg, W. Va.	785	35	2.6	1	0.9	25, 27-31	1.3	1.7
Point Pleasant, W. Va.	703	36	2.1	16	0.9	11, 14; 21-23	1.2	1.2
Catlettsburg, Ky	651	50	2.6	26	0.9	1, 2	1.8	1.7
Portsmouth, Ohio	612	50	3.0	18	1.7	24	2.2	1.3
Cincinnati, Ohio	499	45	4.2	20	3.0	26	3.5	1.2
Louisville, Ky.	367	24	4.3	10-14; 23-25	3.2	1	4.0	1.1
Evansville, Ind	184	30	1.0	1, 16, 22	0.4	6	0.8	0.6
Paducah, Ky.	47	40	0.1	1, 2	− 0.3	8-11	−0.1	0.4
Alleghany River.								
Warren, Pa	177	7	0.0	1-31	0.0	1-31	0.0	0.0
Oil City, Pa	123	13	0.3	1-3	0.0	17-31	0.1	0.3
Parkers Landing, Pa.	73	20	0.2	1-3	− 0.4	30, 31	−0.1	0.6
Freeport, Pa.	26	20	1.0	1	0.4	19-31	0.5	0.6
Conemaugh River.								
Johnstown, Pa.	64	7	1.4	1	0.4	26-30	0.7	1.0
Red Bank Creek.								
Brookville, Pa.	35	8	− 0.2	1-31	− 0.2	1-31	0.2	0.0
Beaver River.								
Ellwood Junction, Pa.	10	14	− 0.5	1, 2	− 1.3	28-31	−0.9	0.8
Cumberland River.								
Burnside, Ky	434	50	− 0.4	17-20	− 1.0	11	−0.7	0.6
Carthage, Tenn.	257	30	0.3	13, 14	0.0	30, 31	0.1	0.3
Nashville, Tenn	175	40	0.4	1, 2, 17	0.0	25-27; 30, 31	0.2	0.4
Great Kanawha River.								
Charleston, W. Va.	61	30	7.2	15	5.7	18	6.2	1.5
New River.								
Hinton, W. Va.	95	14	2.3	14	0.8	7-12	1.2	1.5
Licking River.								
Falmouth, Ky.	30	25	0.4	1, 2	0.0	17-20	0.2	0.4
Miami River.								
Dayton, Ohio	69	18	1.0	13, 14, 24	0.5	8-11	0.7	0.5
Monongahela River.								
Weston, W. Va	161	18	− 2.2	2-15	− 2.5	18-31	−2.4	0.3
Fairmont, W. Va	119	25	− 0.6	1-9	− 0.7	10-31	−0.7	0.1
Greensboro, Pa.	81	18	5.8	1-5	4.3	27, 28; 30, 31	5.1	1.5
Lock No. 4, Pa.	40	28	7.4	3, 4	4.7	30, 31	6.0	2.7
Cheat River.								
Rowlesburg, W. Va.	36	14	0.1	1	− 1.2	25	−0.6	1.3
Youghiogheny River.								
Confluence, Pa.	59	10	0.4	1	− 0.1	20-31	0.0	0.5
West Newton, Pa.	15	25	0.2	1-5	− 0.2	22-31	0.0	0.4
Muskingum River.								
Zanesville, Ohio	70	20	5.3	16, 18, 23; 26, 28	4.6	10, 11	5.0	0.7
Tennessee River.								
Knoxville, Tenn.	614	29	0.2	1	− 0.3	14-19	0.0	0.5
Kingston, Tenn	534	25	0.5	23	0.0	1-19; 26-31	0.1	0.5
Chattanooga, Tenn.	430	33	2.0	21	0.4	8-10	1.0	1.6
Bridgeport, Ala	390	24	0.8	22	− 0.2	9-12	0.2	1.0
Florence, Ala	220	16	0.3	25, 26	− 0.5	11	−0.1	0.8
Johnsonville, Tenn.	94	21	0.7	28	− 0.3	6-20	0.0	1.0
Clinch River.								
Speers Ferry, Va.	156	20	− 0.6	3, 6, 7, 12, 13, 19, 20, 23, 25-27, 29-31	− 0.8	10, 15-17	−0.7	0.2
Clinton, Tenn	46	25	2.4	25-27	1.8	3, 11	2.1	0.6
Wabash River.								
Mount Carmel, Ill	50	15	0.7	1-3	0.5	21-31	0.6	0.2
Red River.								
Arthur City, Tex.	688	27	4.1	1	2.4	28-31	2.9	1.7
Fulton, Ark	565	28	3.7	2	1.4	26-30	2.0	2.3
Shreveport, La.	449	29	− 0.2	7, 8	− 1.6	28-31	−1.0	1.4
Alexandria, La	139	33	− 1.9	12, 13	− 2.8	26-28	−2.4	0.9
Atchafalaya Bayou.								
Melville, La	100*	31	2.7	2-4	1.6	26-30	2.2	1.1

Heights of rivers above zeros of gauges—Continued.

Stations.	Distance to mouth of river.	Danger line on gauge.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Ouachita River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Camden, Ark	340	39	2.6	11-17	2.4	19-30	2.5	0.2
Monroe, La	100	40	0.0	1-31	0.0	1-31	0.0	0.0
Yazoo River.								
Yazoo City, Miss	80	25	− 2.4	12-14	− 2.7	2-4, 31	−2.6	0.3
Chattahoochee River.								
Columbus, Ga	140	20	0.1	24-27	− 1.5	10-12, 16	−0.8	1.6
Flint River.								
Albany, Ga	80	20	1.7	4	0.8	12, 28	1.2	0.9
Cape Fear River.								
Fayetteville, N. C	100	38	2.2	27	0.2	8, 9	0.9	2.0
Columbia River.								
Umatilla, Oreg	270	25	2.8	23, 24	2.1	31	2.6	0.7
The Dalles, Oreg	166	40	4.9	9	2.8	31	4.0	2.1
Willamette River.								
Albany, Oreg	99	20	2.5	26	1.0	1-19	1.2	1.5
Portland, Oreg	10	15	3.2	29	0.4	21	2.0	2.8
Edisto River.								
Edisto, S. C	75	6	4.8	1, 2	2.6	12, 13	3.6	2.2
James River.								
Lynchburg, Va	257	18	0.4	24	− 0.2	1-11	0.0	0.6
Richmond, Va	110	12	1.0	27	− 0.3	4-14	0.0	1.3
Alabama River.								
Montgomery, Ala	265	35	− 0.2	19	− 1.5	6-16	−1.2	1.3
Selma, Ala	212	35	− 0.8	21	− 2.0	1-19	−1.8	1.2
Coosa River.								
Gadsden, Ala	144	18	− 0.3	21-26	− 0.8	2-11	−0.6	0.5
Tombigbee River.								
Columbus, Miss	285	33	− 3.2	12	− 3.7	28-30	−3.6	0.5
Demopolis, Ala	155	35	− 2.4	1-6	− 2.6	13-31	−2.5	0.2
Black Warrior River.								
Tuscaloosa, Ala	90	38	− 1.6	1, 23-31	− 1.9	6, 9-21	−1.8	0.3
Pedee River.								
Cheraw, S. C	145	27	11.2	14	0.3	12	1.5	10.9
Black River.								
Kingstree, S. C	60	12	3.6	31	1.0	15-18	2.2	2.6
Lumber River.								
Fairbluff, N. C	10	6	0.5	31	− 0.8	11-13	−0.2	1.3
Lynch Creek.								
Effingham, S. C	35	12	3.7	26	2.1	7-13	2.6	1.6
Potomac River.								
Harpers Ferry, W. Va	170	16	0.4	26-28	0.0	4-24	0.1	0.4
Roanoke River.								
Clarksville, Va	155	12	0.3	20, 29	− 0.1	5-11	0.1	0.4
Sacramento River.								
Redbluff, Cal	241	23	1.2	23	0.0	1, 10, 11	0.4	1.2
Sacramento, Cal	70	25	10.0	25, 26	8.3	1-3	8.8	1.7
Santee River.								
St. Stephens, S. C	50	12	6.5	18	− 1.3	9, 10	1.8	7.8
Congaree River.								
Columbia, S. C	37	15	3.5	14	1.5	1-12, 16-20, 24-31	1.7	2.0
Wateree River.								
Camden, S. C	45	24	12.4	14	1.6	10	3.7	10.8
Savannah River.								
Augusta, Ga	130	32	8.5	14	3.9	11	5.5	4.6
Susquehanna River.								
Wilkesbarre, Pa	178	14	0.0	1-31	0.0	1-31	0.0	0.0
Harrisburg, Pa	70	17	1.8	1	0.5	21	0.9	1.3
Juniata River.								
Huntingdon, Pa	80	24	3.0	26	2.8	1-25, 28-31	2.8	0.2
W. Br. of Susquehanna.								
Williamsport, Pa	35	20	0.9	1, 2	0.3	9-12, 18-20	0.5	0.6
Waccamaw River.								
Conway, S. C	40	7	2.7	21	1.1	14, 15	1.9	1.6

*Distance to Gulf of Mexico.

SPECIAL CONTRIBUTIONS.

WINDS AND CLOUDS.

By Professor BRILLOUIN of the École Normale Supérieure, Paris.

[Translated from the Annales de Chimie et de Physique, October, 1897, pp. 145-153, and Ciel et Terre, October 16, 1897, pp. 393-399. Communicated as a summary of a more elaborate memoir that will be published in the Annals for 1898 of the Central Meteorological Bureau of France.—C. A.]

After having for a long time devoted their efforts to the study of atmospheric pressure, meteorologists have now turned their attention to the clouds; they photograph them and endeavor above all to record the heights of the various types. The description of the forms and their relations to meteorology in general has made but very little progress because in most of the recent treatises the chapters relating to the clouds have been restricted to the enumeration of the different types adopted by the international conferences without any further indications.[1] Some treatises are even more positive, and formally declare that up to this time it has not been possible to make any use of the aspect of the sky for forecasting the weather;[2] this is probably true of the central offices of the weather services on account of the insufficiency of the short telegraphic dispatches, but is quite the reverse when we consider the experience of an isolated observer.[3] The appearance of the sky suffices to show what is passing at a distance of at least 100 or 200 kilometers from any station, but the experience acquired is personal because it is synthetical. This is affirmed even by those who have bestowed the most labor on this subject, e. g., Clement Ley[1] from a narrow point of view; Abercromby[2] with more independence of thought. It appears then that theory alone should be capable of defining absolutely consistent types, and of analyzing and describing all their characteristics. Unfortunately, until within recent years, theory has dealt only with two kinds of action capable of producing condensation,[3] viz, the expansion to which we owe the cumulus clouds, and the cooling by radiation which produces the stratus clouds; these two forms which are characteristic of permanent conditions are, therefore, useless, or nearly so, for forecasting.

The transient forms which correspond to the changes of weather are due to the mixtures of air from contiguous regions, one of which is calm and the other is in movement; but the theory of these clouds due to mixture has hitherto been unapproachable. At first, the physical theory of condensation by mixture was so complex, from an analytical

[1] Lancaster remarks that this opinion, which was true ten years ago, is no longer so to-day. The investigations into the forms of clouds and the relations of these to the various atmospheric conditions are now carried on everywhere with great activity, and very important works on this subject have been recently published. Among the most recent and most interesting we mention the beautiful memoir of Mr. H. Helm Clayton, "Discussion of the Cloud Observations made at the Blue Hill Observatory," which forms the fourth part of Volume XXX of the Annals of the Astronomical Observatory of Harvard College, Cambridge, Mass. This memoir is accompanied by numerous plates, and contains more than 200 quarto pages.

[2] Van Bebber. Handbuch der ausübenden Witterungskunde, 2 vols., 1886. Die Wettervorhersage, 1 vol., 1891, pp. 50.

[3] The upper and lower clouds were elaborately observed and telegraphed for the use of the daily weather bulletin of the Cincinnati Observatory, beginning with September, 1869, and have also been telegraphed and shown on the tridaily charts of the Signal Service and Weather Bureau ever since July, 1871. They have often proved of great importance in making up the weather forecasts.—C. A.

[1] Modern Meteorology (1878). Fourth Conference. Clouds and Weather Signs, by Cl. Ley, pp. 102-136. Aids to the Study and Forecast of the Weather, 1880. Cloudland, 1891, 1 vol.

Unfortunately Ley ascribes everything to the "cyclones" of the temperate regions. A glance at his illustrations will show that we have to do, not with the coordination around a center, but with two contiguous currents which interfere with each other and are equivalent to the sketch given farther on. Ley's diagram is simply reproduced by Sprung in his Lehrbuch der Meteorologie, 1885.

[2] Weather: A Popular Exposition of the Nature of Weather Changes from Day to Day, by the Hon. Ralph Abercromby (3d edition), 1892. 1 vol., London. Tropical and Extratropical Cyclones (Proc. of the Royal Society of London, Vol. XLIII, 1887, pp. 1-30). This article was written on his return from a meteorological journey around the world. In the two pages of "Conclusions" the author admirably describes the difference between the storms of our latitudes and those of the tropics; the last phrase, which gives more importance to the analogies than to the differences, is the only part that is ordinarily quoted.

[3] It should perhaps be said that the older theory of mixtures was equally prominent until Espy and Hann forced it into the background. (See Hann's Memoirs, translated by the Editor, in the Ann. Rep. Smithsonian Inst., 1877.)—C. A.

point of view, that no descriptive enumeration of the various possible cases could be attempted; this gap has been filled by the several memoirs of Professor von Bezold[1] and the methods for detailed graphic discussion that he invented; this suffices for the study of mixtures in calm weather, but these mixtures are of little activity and of little interest. As to the mixtures produced by different or opposing contiguous winds, not only was it not known how to study them, but the theory of the general circulation of the atmosphere systematically ignored them. Up to the time of the publication of the fundamental memoir by von Helmholtz,[2] which, in spite of the authority of this eminent physicist, passed unnoticed[3] all the attempts to frame a theory of the general circulation embraced the atmosphere of the globe as a whole.

The continuity of the general movements, which is only an arbitrary hypothesis, was, and still is, regarded by the greater number of theoretical students as an axiom that is so self-evident that it is useless to enunciate it;[4] now it is precisely the opposite to this that is in evidence and that results from daily observation. The atmosphere is divided into regions having different characteristics as to temperature, cloudiness, and velocity of the wind, which are separated by zones often very insignificant but permanent when they follow the coast line of continents and oceans. These discontinuities are by no means incompatible with the aerodynamic theory; quite the contrary; in an ideal fluid that is nonconductive as to heat and has no internal friction there is no condition of continuity attached to the distribution of the temperatures. Only two conditions of continuity are imposed upon the velocities, i. e., that of the conservation of matter and that of the continuity of pressure,[5] but not the continuity of the derivatives of pressure, viz, the gradients. Any different winds whatever may exist on the two sides of a surface of separation. Aerodynamics will teach us what forms and what movements this surface of separation may assume.

Continuity of temperature and of velocity is imposed only in a single case: that in which numerous causes of local disturbances, small and alternating, and averaging zero, produce a large number of restricted and slow circulations throughout the whole zone. In this case the transportation of matter, with its thermic and dynamic properties, produces a general continuous state *by convection;* this is illustrated by the average condition produced in extended zones by the alternations of day and night. In the terrestrial atmosphere the conductivity, the internal friction, and the diffusibility are so very small that *in the absence* of mixtures it would require centuries of time for the penetration of motion, or of heat, or of aqueous vapor, to only a few tens of meters from a surface of initial discontinuity, as Helmholtz has reminded us[6] in the beginning of the above-mentioned memoir.

[1] Sitzungsb. der Berliner Kon. Akad., 1888. (Translation in Abbe's Mechanics of the Earth's Atmosphere.)

[2] Sitzungsb. Kon. Akad., Berlin, 1888–89.

[3] This memoir is well known to the majority of meteorologists in Germany, England, and America. It is summarized in Waldo's Modern Meteorology, and is given in full in the Editor's collection of translations published by the Smithsonian Institution as the Mechanics of the Earth's Atmosphere.—C. A.

[4] The discontinuous phenomena of the general circulation have been dwelt on by Ferrel, Margules, Teisserenc de Bort, Rausenberger, and others.—C. A.

[5] That is, the continuity of pressure in the case of movements that are propagated slowly. Discontinuities of pressure are possible, but they are propagated with the velocity of sound and play no role in the general circulation, however much they may influence certain special phenomena.

[6] In order, by the influence of viscosity, to reduce by one-half the difference of velocity at the soil and at the upper surface of the atmosphere, supposed to be homogeneous and 8 kilometers deep, forty-three thousand years would be required. In order to reduce the difference of temperature by one-half by the process of conduction of heat thirty-six thousand years would be required.

Thus, the whole theory of the movements of the atmosphere becomes essentially that of the subdivision of the atmosphere into distinct convective zones (areas of high pressure, the anticyclones of the meteorologists or the regions of calms of M. Duclaux) and that of the permanence, or the gradual, or the instantaneous transformation of the surfaces of these convective zones. This subdivision, moreover, is theoretically inevitable, since in an annular zone in a state of average convection, the motion obeys the law of the areas; in this case the velocity of the wind varies in an inverse ratio to its distance from the axis of rotation. These velocities would become formidable in a zone of small extent in latitude did they not produce spontaneously a mechanism of energetic resistance. This consists in the mixtures of contiguous zones, produced either by the inequalities of the ground or by the inequalities of density which regulate the movement and moderate the velocity of the wind. This mechanism, however, does not act uniformly throughout the whole extent of the atmosphere, since neither is the soil uniformly undulating, nor is the atmosphere uniformly cloudy. The plains and the mountains, the continents and the seas, give rise to natural zones whose properties are diverse and indicate the natural position of the surfaces of separation.

In the memoir already alluded to Helmholtz has investigated, by analytical methods, the form of the separating surfaces of annular zones surrounding the whole globe and the position occupied by the ring of mixture between the two zones which produce it, but he has restricted himself to the case of dry air which leads to very simple results.

The combined study of these two memoirs, one by von Bezold, the other by von Helmholtz, has enabled me to study and describe every form of cloud characteristic of contiguous, stable, cloudy zones, as also the changes, either slow or rapid, that accompany them, and the encroachments inversely below and above in the atmosphere (the derived currents and the interpolated layers of M. Duclaux) which necessarily result from certain distributions of temperature and cloud.

I had first to complete von Bezold's theory of mixtures by insisting on the fact that a mixture of cloudy air and of clear air, containing but little moisture, is always accompanied by a fall of temperature produced by the partial evaporation and that for certain proportions the mixture is colder[1] than the colder of the two components. The mixture is, therefore, also denser, and falls downward between the two components under the form of a "very cold wave," being clear if the evaporation is complete but foggy if the evaporation is not completed.

On the contrary, two saturated components always give a feebly cloudy mixture of intermediate temperature, but a little above the mean of the component temperatures these thin clouds are feebly ascendant in calm weather.

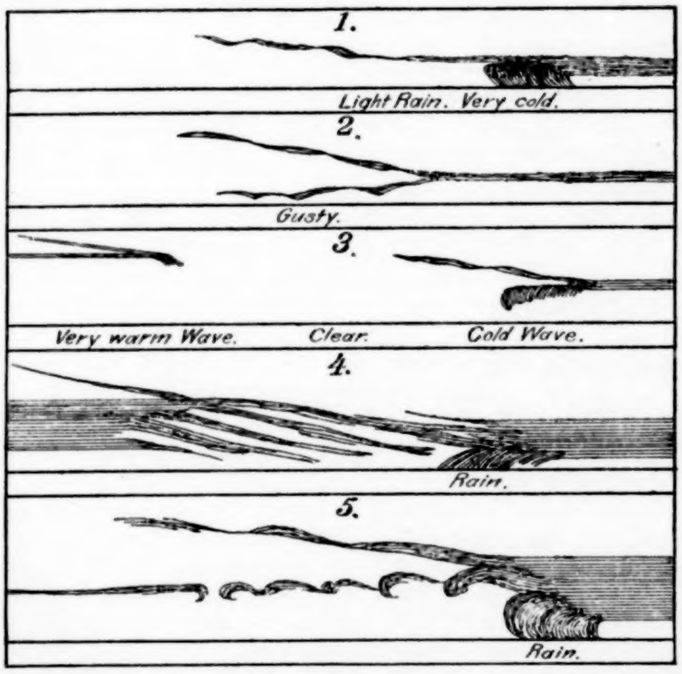
Taking up the theory of Helmholtz under an elementary geometric form, I have given a simple exposition of it, and have developed the discussion of the form and of the stability of the surfaces of separation of two regions having unequal cloudiness and animated by different winds, and have traced outline sections of the bands, together with their systems of clouds, formed where these two zones intermix, one ascending and the other descending, and have indicated the cases in which the resulting rain will fall in showers or continuously, and on the contrary, the cases in which the sky will clear up and the appearances it will present.

I will at present limit myself to indicating the essential points of this study. First, when one desires to study the movements of the atmosphere with respect to the rotating terrestrial globe, it is necessary to take account, not only of the real forces, but of the apparent forces, such as the simple

[1] Von Bezold, 3d Memoir, October, 1889, art. c., translation in Mechanics of the Earth's Atmosphere, p. 274.

and composite centrifugal forces, which are due to the mobility of the reference axes. Two equal masses animated by different movements are, in the case of rotation, not subject to equal forces. In a convective zone (viz, where motion exists) the level surfaces are not parallel to the surface of quiet water; they are more concave toward the center of the globe. Pressure diminishes slowly from the center of such a zone toward its boundaries.

The surface of separation between two zones is the locus of the mutual intersections of level surfaces having the same numerical designation in the two zones [viz, the place of intersection of the equivalent contour lines in the two zones.—C. A.]. This surface can have any inclination whatever to the horizon; it is parallel to the axis of rotation of the earth if the densities are equal, although the velocities may be different. Two conditions are necessary for stability; one of these I shall call *thermic*, the other *dynamic*. The thermic condition requires that in going from the ground upward in the direction of the pole, but not in the direction of the vertical, one shall meet layers of air of decreasing density; the dynamic condition is that the velocity of the wind toward the east shall decrease as we traverse horizontally over the discontinuous surface (the surface of separation) in the direction of increasing latitude. In a ring of mixture [i.e., the belt along a small circle of latitude between the northern and southern components.—C. A.], where the relative proportion of the two components varies progressively, the dynamic condition is that the velocity of the wind toward the east shall increase less rapidly as we go from south to north than in a homogeneous ring in convective equilibrium.



The left hand side of this diagram is the polar side: Cold above, wind from the east.

The right hand side is the equatorial side: Warm above, wind from the west.

As to the position of the mixture, higher or lower in the atmosphere, this also depends upon two conditions, one thermic and the other dynamic. In the case of mixtures of two zones of dry air, the dynamic condition has a preponderating influence, since the specific volume of the mixture is then equal to the average of the specific volumes of the components; but this is not the case when there is any condensation, and especially when there is any evaporation, to even a limited amount. From this there results, at different altitudes, on the surface of separation of two unequally cloudy zones certain tendencies, sometimes concordant, but unequal, sometimes opposed to each other, to which I have devoted a somewhat minute discussion. The preceding figure represents an outline section of the five most important cases and explains itself.

During the many years that I have studied the sky, I have very frequently observed, in all their purity, the more typical forms of clouds in continuous zones occupying the whole sky. It was the almost complete absence of these forms from the International Cloud Atlas and the evident insufficiency of the descriptions in that atlas which, by exciting my curiosity, led me to undertake to study their theory. Hereafter, excepting any errors that I may have made in this study, the signification of any given aspect of the sky will be associated with a perfectly definite atmospheric condition as to the direction and force of the wind, the inequalities of distant temperatures, the relative altitudes and thicknesses of distant clouds, and the consecutive modifications of these conditions. We have no longer to do with personal and local experience, but with an analytical description of a small number of characteristics, easy to comprehend and applicable at every locality throughout the globe.

My very extensive memoir is at present in press and will appear in "Annales" of the Central Meteorological Bureau of France, 1898. The object of this short note is to point out to physicists the fact that the questions of general meteorology belong to their domain and merit their attention, and that however difficult they may appear they are not unsolvable.

The types shown in the five sections of the accompanying diagram differ only as to the thickness and the elevation of the cloudy layers. In the neighborhood of the ground the variation of temperature with latitude is inverse to that which obtains in the upper levels; the ring of mixture extends around the earth on parallels of latitude nearly uniformly at the same level as that of the two zones throughout their whole extent; generally it rises to the upper part of the atmosphere on its polar side, and on its equatorial side descends to the lower atmosphere near the ground.

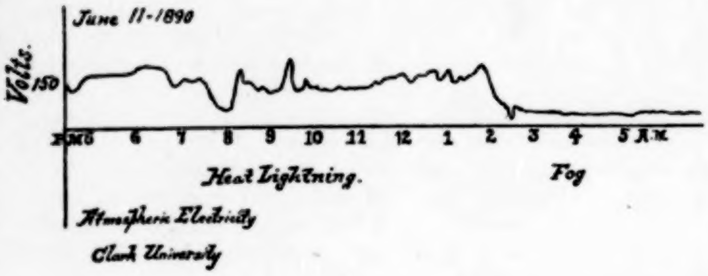
The more complicated types in which the variation of temperature with latitude has the same sign above and below, but the opposite sign at a medium altitude, are also described in the complete memoir; these give rise to thunderstorms.

CLIMATE AS A CONTROLLING FACTOR IN LONG-DISTANCE TRANSMISSION OF ELECTRICAL ENERGY.

By ALEXANDER G. MCADIE (dated August 27, 1897).

Those of us who have done any experimental work in atmospheric electricity, at a very early period in our experiments, learned the necessity of an almost perfect system of insulation, in dealing with the very high potentials likely to be encountered. In fact, with all our care, there is always a lingering suspicion in examining photographic records, that the running down of the voltage in foggy and damp weather was, in large measure, the consequence of the defective insulation due to a deposit of the moisture. The careful worker will always rigorously and frequently test his insulators. In the material, glass with sulphuric acid, and in the shape of the insulator, we strive to prevent any creeping or leaking of the charge. The Mascart table and suspension insulators which are now to be found in most physical laboratories are excellent and embody the principles upon which the future high-test insulators must be constructed. Since they were designed, however, both mica and quartz have come into commercial use, and it might be interesting to compare insulators made of these materials with the standard Mascart patterns. But even with a good insulator we must watch constantly the hygrometric condition of the air, for the insulation which is

excellent in the afternoon may weaken materially during the night. I found it advisable at Clark University, some years ago, to keep an extra set of dry, clean Mascart table insulators always in readiness. Almost every morning, after tests, the insulators were exchanged with those under the collector which stood in a wooden shelter, projecting from a second-story window and exposed to the weather. Indeed, a very good hygroscope might be devised upon this variation of insulation with humidity. The accompanying diagram shows the potential curve obtained with a photographic Mascart electrometer and outfit. It is interesting to note the fall in



the potential with the occurrence of fog. This may have been a natural fall, for in the diurnal curve a minimum occurs about the time of sunrise; or it may have been, and in all probability was, brought about by the decreasing insulation. There are, however, different kinds of fog; so also, do we find different values of the potential at times of fog, and to some degree the electrometer takes note of the difference. Generally with fog, haze, and smoke there is a rapid fall from high positive to low positive or negative values. Dust whirls, because of frictional effects, give marked disturbances. But fogs, after fine drizzling rain, as a rule, give high positive values. On October 4, 1886, at the top of the Washington Monument during a light and seemingly dry fog, I obtained potentials of over 700 volts, and had no difficulty in drawing small sparks. Simultaneous observations were made at a station 450 feet lower, and potentials of 140 volts, on the average, were obtained. These were high values for this elevation and exposure. On the day following, about the same in general character except for the fog, the potential values were but one-half the former *at both stations.*

The great problem then in atmospheric electricity has been to preserve a high insulation in the apparatus. There is another question, viz, the breaking down of the air itself. For example, after the passage of an electric current, as in the case of a flash of lightning, the particular path is defective thereafter and allows easy escape of high surface charges. Then again, as Hallwachs, Elster, and Geitel, and others have shown, a negatively charged surface will discharge into air under the influence of ultraviolet light. What is of significance to the meteorologist, in these investigations, is the apparent relation, as Schuster points out,[1] "between the ultraviolet radiations and the amount of aqueous vapor present in the air."

Much could be said concerning these potential falls and the accompanying phenomena; but the object of the present paper is rather to trace the dependence of the industrial applications of electricity upon atmospheric conditions. More particularly the point is that electrical development is reaching a limit because of unsuitable insulation. In other words, so rapid has been the advance in the use of high potentials that the electrical engineer to-day is very nearly in the position of the experimenter in atmospheric electricity. He has to deal with potentials of enormously high voltage, and realizes that the successful transmission of the same will be determined largely by the insulation, and this in turn is determined by the weather.

[1] Lecture before Royal Institute, February 22, 1895.

Electrical journals are largely filled at present with accounts of the transmission of electrical energy from mountain streams to towns and cities many miles distant. For example, a power company with a plant in the mountains, contracts to deliver at a city 25 miles away, a three-phase alternating current of 2,500 volts pressure. Through the agency of step-up transformers the potential is sent up to 11,000 volts and transmitted thus, mile after mile in the open country. Reaching the city, it is transformed down, first to 2,000 or 2,500 and then again to 100 or less. In reading the description of such a system, one is attracted first by the step-up transformers. These cast iron, oil-filled, water-jacketed boxes are more or less at the mercy of the weather. Secondly, the large copper wires carrying the high potentials, must be very well insulated. As we read of triple-petticoated insulators, we recall the earlier struggles of the investigator of atmospheric electricity.

In further applications of high potential electricity then, there will be limitations because of atmospheric conditions. Will the meteorologist, with his knowledge of the physics of the air, come to the rescue and point out the proper directions for experiment with the aim of overcoming present difficulties?

That the views set forth above are not exaggerated, the following editorial from the Journal of Electricity of May, 1897, will prove:

* * * Science has well in hand the control of lightning, of static effects, and of the mechanical features that give permanence, safety, and reliability to overhead transmission lines, nor is difficulty experienced in the handling of line voltages at present used, but the barrier—thus far insuperable—to the employment of higher potentials is, as stated, embodied in the insulator alone.

Climate exerts a potent influence on the reliability of insulators, and so great is this influence that to it rather than to the insulator itself may be attributed the existing limitations to the commercial use of higher voltages. In addition to being a practically perfect nonconductor, the insulator should be wind, rain, snow, sleet, dust, and insect proof. Its reliability as a sure preventive against all possible sources of trouble should be absolute, for if susceptible to breakdowns, its weakness necessitates the duplication of the transmission lines that no interruption to service may occur in making repairs. The saving in copper which will result from the invention of a perfect insulator would be twofold in that it would enable the use of higher voltages and require only a single transmission line. Truly may it be said that unlimited reward awaits the inventor of a perfect high-tension insulator.

ATMOSPHERIC ELECTRICITY: ITS ORIGIN, VARIATIONS, AND PERTURBATIONS.

By Prof. MARCEL BRILLOUIN, of the École Normale Supérieure of Paris.

[Translated from the Revue Générale des Sciences pures et Appliquées, August 30, 1897; and from Ciel et Terre, October 1, 1897.]

The origin of atmospheric electricity still remains quite unknown; the suggested theories all rest upon properties that are hypothetical or even contradictory to experience. It has long seemed to me that the action of the ultraviolet radiations from electrified bodies furnishes an entirely satisfactory explanation, assuming only that ice acts in the same way as metals; as to this latter assumption I was able to satisfy myself during this past winter.

The following lines give a brief synopsis of this physical theory of the electric phenomena of the atmosphere:

1.—In 1887 Herz discovered that the electric discharge occurs more easily under the action of ultraviolet light than in the dark. In 1888 Wiedemann and Ebert showed that this action takes place at the "cathode" or negative electrode; that its effect is a maximum when the air is under a pressure of about 300 millimeters of mercury; according to Arrhenius the maximum occurs when the air is under a pressure of 6 millimeters, but according to Stoletow, at a pressure that varies very nearly in proportion to the intensity of the electric field.

An attentive study of this action has shown that *all metal surfaces charged with negative electricity lose this electricity when they are exposed to ultraviolet radiations, however feeble the negative charge may be.*

The action upon positive electricity is null.

M. Rhigi and M. Stoletow have even been able to make use of this action for the purpose of measuring differences of potential at the very point of contact of two electrodes.

2.—M. Buisson who has tested this most delicate action of the ultraviolet light has, at my request, made a series of experiments upon ice as compared with zinc.

A beam of ultraviolet light (electric arc between aluminum electrodes) traverses a perforated brass plate that is positively electrified and then falls upon a block which forms the negative armature of the condenser. This block of ice rests upon a metallic plate having insulating feet and is connected with an electrometer. At first the ice and the electrometer are put in electric communication with the ground, whereby they are brought to the same negative potential and then this connection is broken. As soon as the beam of ultraviolet light is thrown upon the ice the needle of the electrometer moves and shows that the block of ice loses its negative electricity until the potential of the ice and of the brass plate are equal.

The action upon a block of *dry* ice, when just taken from a refrigerating mixture, is very intense (of the tenth to the twentieth order relative to the action on zinc). As soon as the surface of the block begins to melt the action of the ultraviolet light decreases very much; finally, when the water resulting from melting covers the whole illuminated surface of the block the loss of negative electricity becomes inappreciable.

Such are the results that were obtained during this winter (1896–97) by M. Buisson in the physical laboratory of the École Normale at Paris.

Ice is very sensitive to the ultraviolet radiations; water is nonsensitive.

3.—When we consider the unquestionable influence of the diminution of pressure upon the action of light and on the absorption of the ultraviolet solar light by our atmosphere, these laboratory results transform my hypothesis as to the origin of atmospheric electricity into an experimental theory worthy of publication.

If, at any time whatever, an electric field exists in the atmosphere, the ice needles of the cirrus clouds become electrified by induction, positively at one end, negatively at the other. If now, the negative extremities of these ice needles should receive ultraviolet solar radiations, the needles thus illuminated would lose all their negative charge and remain electrified *positively*.

The neutral or negative state of the cirri is unstable; every cirrus cloud illuminated by the sun becomes positive.

4.—Furthermore, experience has shown that the air thus illuminated by sunlight remains a good insulator (contrary to what occurs with the Roentgen rays). In the laboratory experiments, where the positive conductor is very near to the negative conductor, the transportation of electricity by the movement of the air is rapid. In the atmosphere it will be quite otherwise.

If the negative electricity lost by the ice needles is deposited in the surrounding air, then the cloud, as a whole, appears positive when the ice needles become separated from the surrounding air.

The neutral state of the air is unstable. The air which traverses a region where illuminated cirri are formed becomes negative. The neutral air into which a positive cirrus cloud has evaporated into invisibility has become positive.

In the formation of cirri by mixture there frequently occur independent movements of contiguous masses of air—some cloudy and others clear. The negative air will then separate from the positive cirrus.[1]

If the mass of negative air descends, and if continuing negative (for the electricity can not be destroyed) it reaches the cultivated soil, the innumerable points of the blades of grass and leaves will facilitate the discharge of electricity between the earth and the air. Hence, *the soil of a continent is charged negatively by exchange with the air.*

At the surface of the ocean there occurs nothing similar to this; the descending air remains negative; it becomes saturated with vapor, but when this vapor ascends and by expansion is condensed into fine droplets these little drops, like fine points, borrow their electric charge from the air. Hence, *the cumuli formed by expansion over the oceanic regions are negative.*

At the surface of the ground no direct action of the ultraviolet radiations is perceived, both because these radiations scarcely reach it, and because there is no appreciable amount of water there, and because the pressure of the air is high.

5.—It seems useless to dwell upon the characteristics of the diurnal variation of atmospheric electricity and complications that the transportation of electrified air may produce. The influence upon thunderstorms is evident; the same gust of wind that brings rain and showers at night brings thunderstorms at the close of the daylight, when the solar action has electrified the cirrus clouds, and when convection has carried off the negative air. The slowness of this convection also explains the two or three days of threatening weather which, in our climate (of France), generally precede the storm itself.[2]

In regions or seasons where the air is nearly calm (as at the boundary of the cone of the circumpolar shadow of the earth during the winter season) there is so little convection that the cirrus, electrified positively throughout its entire mass during the daylight, remains surrounded by negative air. As soon as the darkness of nighttime prevails the stable condition changes; the electric discharge between the negatively electrified air and the positively electrified needles of ice permeates the whole mass of the cloud. This explanation harmonizes perfectly with all the details of the aurora borealis; it applies also to the luminous clouds sometimes observed in Europe and to the diffuse light observed during summer evenings and called *heat lightning*.[3]

6. Finally, the mechanism of the action of solar disturbances, as seen from this point of view, becomes very simple. Every variation of brilliancy in the ultraviolet light from the sun has an immediate action upon auroras and atmospheric electricity wherever cirrus clouds exist; but its action on thunderstorms may be retarded for several days wherever the cumuli existing below the cirri are neutral or nearly so. The necessity of having cirrus clouds, either preexisting or in process of formation, and of having cumulus clouds localizes this action of ultraviolet rays upon thunderstorms in a manner that varies with the general meteorological conditions.

The importance of the perturbations that are produced in the earth's atmosphere has no relation to the apparent importance of the solar spots and faculæ, but depends exclu-

[1] See memoir on Winds and Clouds by M. Brillouin, to be published in the Annals of the Central Meteorological Bureau of France for 1898; see the summary on page 437 of this number of the MONTHLY WEATHER REVIEW. This idea that positive cirrus and negative air will separate from each other needs to be substantiated by some very convincing experiments.—C. A.

[2] In the United States these days of threatening weather represent more properly the movement of the whole disturbance eastward; at other times they represent the gradual accumulation and spread eastward of thickening stratus haze.—C. A.

[3] There is no longer any doubt that the so-called *heat lightning* is generally produced by distant thunderstorms whose lightning illuminates the sky.—A. Lancaster. [The visibility of auroral beams in daylight is not explained by Brillouin.—C. A.]

sively upon the intensity of the ultraviolet radiation that is transmissible through our atmosphere. Thus, the faculæ, and especially the spots seen with the naked eye, are only imperfect indicators, and it is greatly to be desired that observations such as those of M. Deslandres[1] should be organized and published systematically.

7.—Other phenomena, such as the breaking up into droplets of water falling upon any obstacle, have for some years past been mentioned as having to do with the production of atmospheric electricity. I believe that they play only a secondary rôle as a disturbing action, and that the fundamental rôle is that which I have described above. In general:

Atmospheric electricity is maintained by the action of ultraviolet solar radiations upon the ice needles of the cirrus clouds.

To the same cause is due the necessary initial electric field that is inevitably produced by the relative displacements of the upper masses of the atmosphere in relation to the magnetized terrestrial globe.

THE AREA OF HEAVY RAINFALL IN THE SOUTHERN APPALACHIANS.

By BARRY C. HAWKINS, Voluntary Observer, Weather Bureau. Station, Horse Cove; Post Office, Highlands, Macon Co., N. C. (dated November 3, 1897).

For several years it has been well known by meteorologists that there exists in the southern Blue Ridge Mountains a region where the annual total of rainfall is abnormally large, at least 70 inches, or more. The literature of the subject is about as follows: Numerous brief references have appeared, the most extended being an article in the American Meteorological Journal (May, 1894, Vol. XI, pp. 6–10) by Mr. A. J. Henry, Chief of the Records Division, Weather Bureau. A brief general statement regarding this area and its probable cause is to be found in Prof. M. W. Harrington's ideal and exhaustive report on the rainfall of the United States, published as Bulletin C by the Weather Bureau. Other briefer references are as follows: A statement concerning the portion of the area in North Carolina in the most excellent report on the Climatology of North Carolina, published by the North Carolina State Weather Service and prepared by Mr. C. F. von Herrmann, now director of the North Carolina Section of the Climate and Crop Service, Weather Bureau; also, in Georgia, A Hand Book, issued by the Department of Agriculture of the State of Georgia. It is not my intention to attempt to give reasons for this area of heavy rainfall, but merely to present a comprehensive summary of what is known concerning the geographical distribution of the rainfall, and also the general statistics, including the distribution in the different months.

The area included is the extreme southern Blue Ridge, and covers portions of extreme northeastern Georgia, extreme western South Carolina, and southwestern North Carolina. The counties included are as follows, it being understood that only certain portions in the case of nearly every county are referred to, the records being too few to define the limits more minutely. In the case of Macon County, N. C., it is certain that only the eastern part has an excessive rainfall. The counties marked by a dagger (†) are doubtful, it being only inferred that they are within the area.

North Carolina: Macon, Polk, Clay,† Jackson, Transylvania,† and Henderson.†

Georgia: Rabun, Habersham,† and Towns.†

South Carolina: Oconee, Pickens,† and northern Spartanburg.†

[1] Brillouin evidently refers to the numerous memoirs of Deslandres relative to the ultraviolet radiations from the sun, beginning with his first memoir on the ultraviolet spectrum of aqueous vapor and its relation to the dark lines in the solar spectrum, published in the Paris Comptes-Rendus for 1885, Vol. C, p. 854, and concluding with recent papers recording daily the condition of the sun as to the intensity of its ultraviolet radiations.—C. A.

The stations where records have been kept are as follows, those discontinued being marked with a star (*):

North Carolina: Macon County, Highlands, N. 35° 5′, W. 83° 11′, elevation, 3,817 feet; Horse Cove, N. 35° 0′, W. 83° 6′, elevation (estimated), 2,800 feet. Jackson County, Cashiers,* N. 35° 4′, W. 83° 5, elevation, 3,812 feet. Polk County, Columbus* (now Skyuka), N. 35° 14′, W. 82° 11′, elevation, 3,000 feet.

Georgia: Rabun County, Rabun Gap,* N. 34° 55′, W. 83° 20′, elevation, 2,168 feet; Clayton, N. 34° 50′, W. 82° 20′, elevation, 2,100 feet.

The following stations in North Carolina may possibly be in the area: Henderson County, Hendersonville,* N. 35° 17′, W. 82° 27′, elevation, 2,167 feet; Flat Rock, N. 35° 15′, W. 82° 25′, elevation, 2,214 feet. Transylvania County, Brevard, N. 35° 15′, W. 82° 45′, elevation, 2,500 feet.

Over all the rainy region the annual total is 68 inches, or more. The following are the annual average total rainfalls (in inches) at stations where the data are at hand: Rabun Gap, 68.35 (nine years); Highlands, 76.29 (nine years); Horse Cove, 74.99 (five years); Cashiers, 78.50 (one year).

The distribution of the rainfall by months is very interesting. There is a well marked double maximum and minimum; the maximum is in February or March and the minimum in April or May for the first half of the year; the second maximum is in July or August and the second minimum in October or November.

The maxima at Highlands are: 9.64, in February, and a lesser maximum, 6.04, in September. The minima are: May, 4.19, and a second one, in October, 5.69. It is seen that the total for the wettest month is double that for the driest.

If other stations had long records for *the same term* of years, they would probably have similar features.

The record at Rabun Gap does not closely correspond with that at Highlands. The monthly and annual averages for three stations are given below, but there are several recent years of observations at Highlands which are not included:

Months.	Highlands (9 years).	Horse Cove (5 years).	Rabun Gap (9 years).
	Inches.	*Inches.*	*Inches.*
January	6.72	8.36	7.26
February	9.64	6.39	6.34
March	8.80	4.40	7.60
April	5.92	5.59	5.23
May	4.19	5.42	4.88
June	4.71	8.59	4.59
July	5.31	7.39	4.59
August	5.76	8.16	5.98
September	6.04	6.75	4.73
October	5.69	2.23	6.28
November	6.39	5.37	5.11
December	7.12	6.34	5.76
Annual	76.29	74.99	68.35

The average number of rainy days has been computed for the station at Horse Cove from a nine years' record. Some very interesting facts are shown. The number of rainy days annually is 134. This shows clearly that *rain does not occur any oftener than in regions where the fall is 50 inches or less, but that rains are heavier when they do come.* The monthly maximum is eighteen days in July; minimum, six days in October.

Surrounding the region of 68 inches, or more, there is a large area having a fall of 60 inches, or more, annually, and this area extends to the Gulf Coast; but this area of 60 inches does not come within the consideration of this paper. It is not believed that the area is continuous, as mentioned above, but that islands of heavy rainfall exist here and there on the uplands, with small areas of lighter rainfall on the lower lands, corresponding with the topography. I do not believe that any portions of the region having elevations of 1,500 feet or less are included in the area of 68 inches, or more, of

annual rainfall; neither are extensive northern slopes, as, for instance, the northern half of Jackson County, where the average annual rainfall at Webster is only 35.98 inches (four years' record), although this record is considered rather doubtful.

The western portion of Macon County is not included in the area of 68 inches, as the average rainfall at Franklin is only 57.11. The record at Hendersonville, 66.14, being only for about one year, is of minor value. The most notable features of the distribution as to time are that the excess is due to heavy daily rains, and that there is an excess of rainy days in the summer season. Yet it is possible for severe droughts to occur, as in the summer of 1883 and the autumn of 1897. As a general rule in the winter season less snow falls than in the central portion of the State.

PHOTOGRAPHIC APPARATUS FOR MEASURING THE ALTITUDES ATTAINED BY BALLOONS.

By Prof. L. CAILLETET.

[Translated by the Editor from the Comptes-Rendu, Paris, October 26, 1897.]

I have the honor to present to the academy an apparatus, invented by myself, and which will undoubtedly enable us to solve an important question in physics, viz, the experimental verification of the formula of Laplace, relative to the readings of the barometer at various altitudes, by determining, by means of a photographic measurement, the height reached by the balloon that carries the barometer.

It has been already attempted to measure the height of a balloon by sighting upon it from each of the extremities of a base line whose length is known. In such cases, however, the balloon moves away and soon disappears.

I conceived the idea of replacing the observers on the ground by a photographic apparatus carried up by the balloon, and which would, at short intervals, automatically photograph the surface of the earth over which it passes, while at the same time the face of an aneroid barometer placed in front of a second object glass shall be photographed on the same plate.

This apparatus, which has been studied and constructed with great care by Mr. Gaumont, the skillful director of the General Photographic Company, is composed of a wooden prismatic box, suspended to the balloon in a manner that assures to its axis a sensibly vertical position. On the lower side, facing the ground, is placed an objective, suitably diaphragmed; upon the opposite side there is a second objective, intended to photograph the aneroid barometer, which is placed at a proper distance for obtaining a well-defined image on the sensitive surface. A clockwork movement causes the shutters to move, and these, by opening every two minutes, permit the rays of light to penetrate into the apparatus. A film of sensitive celluloid unrolls itself in front of the objectives, in obedience to a spring contained in a small, independent barrel, and receives upon its two sides the rays thus transmitted.

The dimensions of the proofs thus obtained are 0.13 by 0.18 meter; they give simultaneous observations of the ground, of the figures on the graduated circle of the barometer, and of its index.

When one knows (1) the focal length of the photographic objective, (2) the linear distance between any two given points on the ground, and (3) the linear distance of the same two points on the photographic plate, it is easy to determine, by a simple calculation in proportion, the height at which the balloon was at the moment when the photograph was taken. As this photograph gives also a view of the barometer and its index, and, consequently, of the pressure, we may thus experimentally determine the law connecting the barometric pressure of the atmosphere at various points with the altitudes of these points.

The possible error in the measurement of altitude will depend upon the accuracy of the determination of the focal length of the objective, on the one hand, and the measurement of the photograph, on the other. Now, it is easy to obtain these measurements to within about $\frac{1}{500}$, which would give an approximation of $\frac{1}{500}$ for the altitude determined with the photographic apparatus.

The apparatus thus described, and which had only been tried from the top of the Eifel Tower, has within the past few days been tested in an elevated balloon.

Thursday, October 21, the Aeronautic Committee of Paris made its first scientific ascension for the purpose of experimenting with various forms of self-registering apparatus intended for the contemplated ascensions of free balloons to very great altitudes.

A balloon made of silk, of 1,700 cubic meters capacity (generously offered to the Commission by M. Mascart, in the name of M. Balashoff), started from the gas works of La Villette at 12:40 p. m., and landed at 4:30 p. m. at Cossé-le-Vivien, in the Department of La Mayenne.

(Prince Roland Bonaparte, a member of the French Aeronautic Commission, kindly defrayed the expenses of this first ascension.)

The start and the landing of the aeronauts, Hermite and Besançon, were accomplished without accident, notwithstanding the violent gusts that rendered the preliminary maneuvers very difficult. The scientific apparatus, and especially the photographic apparatus above described, worked admirably. The altitude attained by the balloon was only 2,500 meters, which was due to circumstances over which the aeronauts had no control.

Twenty-six negatives were obtained, which reproduce very accurately the appearance of the ground below the path followed by the balloon. The position of the index of the barometer is shown with great precision in the center of each photograph. In a subsequent, more detailed description of the apparatus I shall explain the method of correcting the errors which may result from the contraction of the film while being dried.

When the photographic apparatus is to be taken up to great altitudes, all possible precautions are taken to prevent the stoppage of its mechanism and that of the barometer, which might be caused by the very low temperatures that we have already ascertained to exist in these elevated regions. Finally, besides the special use for which this photographic self-register was intended, I believe it will be of great service to aeronauts, enabling them, with the aid of a series of successive photographs, to determine the exact route followed by the balloon and to calculate the velocity of its horizontal movement at the various points of its course.

[Photographs from balloons and kites have doubtless been taken on many occasions, with various objects in view. Those made by Prof. S. A. King, the celebrated aeronaut, in Philadelphia, in 1884 and 1885, were studied with a view to the accurate determination of altitudes by the method adopted by Cailletet; but the results were not sufficiently encouraging. In fact, the accuracy of the altitudes and all other data must be greater than $\frac{1}{500}$ if they are to give us valuable information with regard to the reliability of the Laplacian formula. An uncertainty of plus or minus $\frac{1}{500}$ in the altitude is equivalent to an uncertainty of 0.06 inch in the pressure at 30,000 feet or 0.03 inch in the adopted pressure at 15,000 feet. A large amount of uncertainty may be introduced by other sources of disturbance, such as the moisture and the variation of gravity and the temperature of the barometer itself, but principally by the uncertainty as to the real temperature of the air below the balloon. In the case of data recorded at a mile high, as by the self-registers sent up with kites, the pressure and temperature can only be reduced to a uniform high level with any advantage when the altitude has been determined with an accuracy of $\frac{1}{500}$. In fact, the relation between pressure and temperature is at present as important for meteorology as the relation between

these and the altitude. The trouble is not with Laplace's formula, but with the observational data that are adopted when we use that formula.—C. A.]

CLIMATOLOGICAL DATA FOR JAMAICA, W. I.

Through the kindness of Mr. Maxwell Hall, of Montego Bay, Jamaica, the meteorological service of that colony has acceded to the request of the Editor for the prompt communication of an abstract of the very interesting climatological records of that highly important West Indian service. The climatological summary for September, 1897, furnished by Mr. Hall, through his assistant, Mr. Robert Johnstone, of the Meteorological Office, is reproduced in the following table. For descriptive details of the stations and instruments see pages 308 and 356.

Jamaica, W. I., climatological data, September, 1897.

	Morant Point Lighthouse.	Negril Point Lighthouse.	Kingston.	Kings House.	Castleton Gardens.	Hope Gardens.	Stony Hill Reformatory.	Hill Gardens (Cin. Plant.)
Latitude	17°56′	18° 16′	17° 58′		18° 12′			18°05′
Longitude	76°10′	78° 23′	76° 48′		76° 50′			76°39′
Elevation (feet)	8	33	50	400	580	600	1,400	4,907
Mean barometer, 7 a. m.	29.913		29.927		29.595	29.24		25.359
Mean barometer, 3 p. m.	29.877		29.873		29.571	29.23		25.346
Mean temperature, 7 a. m.	83.0		76.4	73.4	70.9	73.2	73.1	62.9
Mean temperature, 3 p. m.	86.2		85.1	84.2	81.0	82.8	78.6	66.5
Mean of maxima			88.8	89.6	86.7	87.9	85.2	70.0
Mean of minima			73.9	67.3	67.3	69.8	72.2	59.5
Highest maximum			91.3	97	92	94	87	74
Lowest minimum			70.7	62	62	67	68	58
Mean dew-point, 7 a. m.			71.1	70.7	68.2	69.5	69.5	58.9
Mean dew-point, 3 p. m.			73.2	77.7	74.7	74.1	75.0	63.6
Mean relative humidity, 7 a. m.			84	93	88	90	88	86
Mean relative humidity, 3 p. m.			68	82	82	74	89	89
Monthly rainfall (inches)	6.62		8.84	10.40	17.15	10.43	16.06	11.32
Average daily wind movement			74.7					19.3
Average wind direction, 7 a. m.	var.		n.					e.
Average wind direction, 3 p. m.	var.		se.					e.
Average hourly velocity, 7 a. m.			1.3					16.5
Average hourly velocity, 3 p. m.			4.9					2.8
Average cloudiness (tenths):								
7 a. m. Lower clouds	2.9		1.0					
7 a. m. Middle clouds	2.7		1.0					
7 a. m. Upper clouds	1.5		4.4					
3 p. m. Lower clouds	3.3		2.5					
3 p. m. Middle clouds	2.2		1.0					
3 p. m. Upper clouds	1.2		3.5					

OCTOBER, 1897.

	Morant Point Lighthouse.	Negril Point Lighthouse.	Kingston.	Kings House.	Castleton Gardens.	Hope Gardens.	Stony Hill Reformatory.	Hill Gardens (Cin. Plant.)
Mean barometer, 7 a. m.	29.868		29.857		29.550	29.18		25.326
Mean barometer, 3 p. m.	29.820		29.826		29.520	29.19		25.303
Mean temperature, 7 a. m.	78.7		74.2	73.1	71.1	71.5	72.7	61.9
Mean temperature, 3 p. m.	83.1		82.2	81.4	79.0	80.2	76.3	64.5
Mean of maxima			85.4	86.7	84.6	83.9	82.8	68.4
Mean of minima			72.2	66.3	68.1	68.4	68.9	58.2
Highest maximum			90.9	92	89	90	88	73
Lowest minimum			70.3	61	66	66	67	55
Mean dew-point, 7 a. m.			71.4	71.0	68.8	69.7	70.0	58.9
Mean dew-point, 3 p. m.			73.1	75.6	72.9	74.4	72.9	61.6
Mean relative humidity, 7 a. m.			91	93	90	93	91	87
Mean relative humidity, 3 p. m.			76	84	78	82	89	90
Monthly rainfall (inches)	25.08		23.45	28.75	20.88	24.60	24.97	32.93
Average daily wind movement			32.8					38.8
Average wind direction, 7 a. m.	var.		n.					se.
Average wind direction, 3 p. m.	var.		se.bys					se.
Average hourly velocity, 7 a. m.	4.7		0.1					
Average hourly velocity, 3 p. m.	8.8		3.5					
Average cloudiness (tenths):								
7 a. m. Lower clouds	4.4		2.5					
7 a. m. Middle clouds	1.5		1.1					
7 a. m. Upper clouds	1.0		2.3					
3 p. m. Lower clouds	4.6		3.5					
3 p. m. Middle clouds	1.9		1.1					
3 p. m. Upper clouds	1.3		2.8					

MEXICAN CLIMATOLOGICAL DATA.

Through the kind cooperation of Señor Mariano Bárcena, Director, and Señor José Zendejas, vice-director, of the Central Meteorologico-Magnetic Observatory, the monthly summaries of Mexican data are now communicated in manuscript, in advance of their publication in the *Boletin Mensual;* an abstract translated into English measures is here given in continuation of the similar tables published in the MONTHLY WEATHER REVIEW during 1896. The barometric means have not been reduced to standard gravity, but this correction will be given at some future date when the pressures are published on our Chart IV.

Mexican data for October, 1897.

Stations.	Altitude.	Mean barometer.	Temperature. Max.	Temperature. Min.	Temperature. Mean.	Relative humidity.	Precipitation.	Prevailing direction. Wind.	Prevailing direction. Cloud.
	Feet.	Inch.	° F.	° F.	° F.	%	Inch.		
Arteaga (Coahuila)			86.4	43.5	67.6				
Barousse	5,414		78.3	37.6	65.3				
Colima	1,656				80.6				
Leon	5,934	24.29	81.7	46.6	64.4	57	0.38	sw.	e.
Linares (New Leon)	1,188	28.75	90.7	51.8	77.9	74	1.46	se.	
Magdalena (Sonora)	4,948				74.3		0.71	sw.	n.
Merida	50	29.87	97.3	63.5	78.6	78	5.51	ne.	w.
Mexico (Obs. Cent.)	7,472	23.08	75.2	45.0	60.3	68	0.97	nnw.	ne.
Monterey	1,626	28.18	89.6	53.6	71.8	68	1.19	e.	w.
Morelia (Seminario)	6,401	23.97	79.9	50.0	64.9	73	0.66	ssw.	ene.
Parras (Coahuila)	3,986		82.8	51.6	69.3				
Puebla (Col. Cat.)	7,112	23.36	80.6	38.3	63.9	60	0.22	nne.	ne.
Saltillo (Col. S. Juan)	5,399	24.86	79.5	44.6	64.2	59	0.24	sw.	n.
Torreon (Coahuila)	3,720		92.1	55.8	76.5				
Vaqueria (Coahuila)			87.4	50.4	63.7				
Zacatecas	8,015	22.53	80.6	39.9	60.8	59	0.47	e.	e.

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By HERMAN W. SMITH, Librarian, Weather Bureau.

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NOTES BY THE EDITOR.

CIRCULAR BY THE CHIEF.

The following circular letter, in reference to Weather Bureau employees in the yellow fever district, is worthy of permanent record:

U. S. DEPARTMENT OF AGRICULTURE, WEATHER BUREAU,
Washington, D. C., November 19, 1897.

The Chief of Bureau wishes to express his high appreciation of the courage and fidelity displayed by Weather Bureau officials on duty at stations where yellow fever prevailed during the late summer and autumn of 1897. More than 1,700 cases of yellow fever are reported to have occurred at New Orleans between September 6 and November 11, and at other cities in the South the disease prevailed to such an extent as to render the positions of the employees of the Weather Bureau perilous.

In the cities of Galveston, New Orleans, Memphis, Montgomery, and Mobile, there were 23 Weather Bureau employees. At Galveston but one employee asked for and received material leave of absence. At New Orleans no leaves of absence were requested; one employee was stricken with fever and survived. At Montgomery two employees made application for and were granted leave during the prevalence of the fever. At Mobile the official in charge was stricken, but at this writing is convalescent.

While no cases of yellow fever are reported to have occurred at Vicksburg or Pensacola, the proximity of these places to fever stricken towns was such as to expose the employees to danger, which was endured without complaint or effort to evade duty during the prevalence of fever in adjacent communities. At Vicksburg an employee who had been granted leave prior to the appearance of the fever declined to leave his station and requested to have his leave cancelled.

The Chief of Bureau feels that too much can not be said in praise of the action on the part of those officials who, amid constant peril, remained faithfully at their posts and performed their arduous duties under the trying circumstances with such zeal and promptness that in no instance has an important duty suffered so far as the Central Office is informed.

WILLIS L. MOORE,
Chief of Weather Bureau.

MOUNTAIN STATIONS IN NORTH CAROLINA.

Under date of October 10, Mr. Barry C. Hawkins suggests the value of establishing a station on Satulah Mountain, near Highlands, Macon Co., N. C., elevation 4,490 feet. He says:

The entire summit of this peak is reasonably level, and the distance from Highlands only one-half mile, and very accessible, only about one-fourth mile being impossible for vehicles. A small building was erected several years ago on the summit and has not been blown away. It would cost little to set up a suitable shelter for instruments, which could be visited once a week or month. No other mountains obstruct the movement of the air, and the conditions approximate those of the free air. Such stations have proved successful in South America where established by Harvard College. Why should they not be desirable here, considering the advantages, i. e., an elevation of about 5,000 feet, only 1 mile from post office, telephone, and necessary materials, and always accessible even in the worst weather?

The station recommended by Mr. Hawkins is one of the highest practicable at the southern end of the Blue Ridge, and is in the midst of the very interesting meteorological conditions to which he has referred in his article on heavy rainfall, published on a previous page of the current number of the REVIEW. A continuous record at the summit would undoubtedly contribute to the elucidation of some interesting meteorological problems if the observers were wide awake to their importance. On the other hand, in view of the many unsuccessful attempts to maintain self-registers in isolated places, without watchful observers, it would scarcely be deemed worth while to court a new failure at this place. The most that could be recommended would be the establishment of a maximum and minimum thermometer and a rain gauge, with a large attachment, so that at the end of each month a visiting observer could measure the total monthly rainfall, and reset the maximum and minimum thermometers. But to secure only these three monthly items seems to savor of meteorological curiosity rather than meteorological science, when we consider the many more important questions that are pressing upon us from all sides for a detailed investigation. Self-registering apparatus maintaining a continuous or very frequent record of temperature, pressure, wind, and rain can not be relied upon to keep in working order many days through all the variations of weather, in spite of troublesome insects, insidious rust, the drying up of the oils, the freezing of the ink, and many other vicissitudes, to say nothing of the curiosity and prying fingers of every visitor, or the superstitions of the ignorant who happen to espy the mysterious station.

A continuous record at a great elevation is one of the greatest desiderata of meteorology, and hundreds of thousands of dollars have been spent in the effort to secure a few such, but they can not be maintained without the attendance of a faithful observer. To this end the Weather Bureau for many years maintained its stations on the summits of Mount Washington and Pikes Peak; to this end the highest possible balloon ascensions are being made by international cooperation; to this end, lately, a systematic exploration, by means of continuous apparatus carried up by kites, has been begun. Eventually, these works may be supplemented by a renewed attention to the establishment of mountain stations, but that labor is too expensive to be entered into without counting the cost.

HYDRODYNAMIC EQUATIONS FOR THE ATMOSPHERE.

Under date of November 5, 1897, Dr. Charles Chree, Director of the Kew Observatory, near London, writes to the Editor as follows:

In the July number of the MONTHLY WEATHER REVIEW I notice a deduction of the hydrodynamical equations in polar coordinates, by Mr. Joseph Cottier, whose death I regret to see mentioned later in your columns. Unknown, doubtless, to Mr. Cottier, I solved the problem in practically the same way without the intervention of Cartesian coordinates, in the Proceedings Edinburgh Mathematical Society, Vol. VIII, 1889-90. My equations (22), (23), (24), l. c., p. 50, agree exactly with Mr. Cottier's (8), p. 301, so far as the hydrodynamical terms are concerned, allowing for the difference of notation (his u, v, w are equivalent to my v, w, u). Like Mr. Cottier, I had not met with Ferrel's corrected equations, but unlike him, I had not even encountered Ferrel's original equations. As Mr. Cottier refers to Basset's (Basset, Hydrodynamics, Vol. II, Equations (24), p. 245) deduction of the equations for stationary axes, it may save trouble to some of your readers if I call attention to a slight error in the third of Basset's Equations (v for w, doubtless a misprint).

The first and last of Cottier's equations (8), on p. 301, may be put in a shorter form by combining v and w terms, writing, for instance, in the first:

$$-\frac{\cot\theta}{r_1}(v+\omega r\sin\theta)^2 \text{ for } -\frac{v^2}{r}\cot\theta - v\omega\cos\theta - \omega^2 r\sin\theta\cos\theta$$

The viscosity terms in the equations on page 302 would, in my opinion, be more conveniently given in a purely polar form, like Basset's Equations (24). These latter equations of course, unlike Mr. Cottier's, are intended to apply to an *incompressible* fluid.

RAIN-DROPS: THEIR SIZE AND RATE OF FALL.

In the course of a detailed study of the phenomena of waterspouts, Prof. F. H. Bigelow suggests the desirability of further statistics as to the actual size of large drops of rain. This is a matter that suggests a series of beautiful laboratory experiments, and we hope that it will be taken up by some of the many physicists who are seeking to apply their skill and the resources of their laboratories to the problems whose solution will give precision to meteorology.

It is evident that the size of the drops must depend upon the surface tension of the water relative to the air or other gas through which the drops are falling; it must, therefore,

vary with the purity and temperature of the water and the electrification of the drops. Experiments should include the salt water of the ocean. As drops falling from a tube or other metal surface depend for their size upon the capillary action between the water and that surface, it would be better to avoid that method of formation of drops and to imitate the rain either by allowing a mass of water to fall through a sieve or by studying the drops formed near the summit of a vertical jet of water at a point where the falling stream breaks into drops. The best memoir upon this subject known to the Editor is one published by J. Wiesner at Vienna in 1895. No copy of this memoir is at hand, but an excellent review is given in the Meteorologische Zeitschrift, July, 1896. In general, Wiesner concludes that the largest drops that fall in tropical rains, and, therefore, anywhere throughout the world, weigh less than 0.26 gram. This result was arrived at by three different methods, but in all three the water was allowed to drop from some solid support, such as the end of a tube or the lower surface of a cloth filter. However large the drops may be at their origin, they soon break up, so that after falling 5 meters their weight does not exceed 0.20 gram, and measurements made during the heaviest natural rains give the maximum rain drop 0.16 gram, while by far the largest number were between 0.06 and 0.08 gram. If drops are ever found larger than these, they can only hold together when falling with velocities much less than would be attained by falling 5 meters. Drops are said to have been observed of one inch in diameter. These must have weighed 7.14 grams and could only have existed for an instant before breaking up. The suggestion that they are simply melted hailstones does not account for their formation, since it would require a considerable time for such large hailstones to melt. They might have been formed by the agglomeration of large drops held up by a momentary rising gust of wind, but could not have held together after that gust had ceased.

Experiments made at Vienna on the velocity of falling drops show that during a fall of 20 meters there is no sensible increase in the velocity, so that drops weighing from 0.01 to 0.25 gram, falling through distances of from 5.5 to 22.2 meters, fall with uniform and approximately the same velocity of somewhat more than 7 meters per second. Special experiments were made to ascertain how far such drops must fall in order to attain this uniform constant speed. The method of determining this distance consisted in examining the characteristics of the blotches made by the falling drops on striking white blotting paper. A maximum velocity is apparently attained by a fall of a few meters, as shown in the second column of the following table, the weight of the drop being given in the first column:

Weight of drop.	Falling distance.	Eventual maximum velocity.
Gram.	*Meters.*	
0.01	1 to 2	7 meters per second in all cases.
0.03	2 to 3	
0.06	2 to 4	
0.07	3 to 5	
0.10	5 to 8	
0.16	8 to 11	
0.20	9 to 14	

It is probable that the acceleration of drops falling from a great altitude does not become zero until the drop has fallen much more than 22 meters. It is also probable that the increasing velocity does not attain a maximum before reaching the earth.

If the latter be true, it seems to the Editor likely that it results from the fact that the drop is perpetually changing its shape, ever adapting itself to the increasing velocity, so that it preserves continuously the shape of a body of swiftest descent for a given velocity and resistance. The resistance is made up of three factors, viz: The inertia of the disturbed air and the viscosity, or internal friction, of the air and, also, of the drop. As the drop passes from the cloud to the earth the inertia resistance increases with the steadily increasing density of the air; the viscous resistance to the air increases with the increasing temperature; the viscous resistance to motions within the interior of the drop diminishes with increasing temperature. Finally, the size of the drop diminishes steadily by evaporation, viz, diffusion, even if the speed does not attain such a limit that the internal motions of the drops break it up into fragments.

These several considerations make it probable *a priori* that the drop eventually falls with uniform velocity and this conclusion is confirmed by the observation made by Mach, that the apparent line of descent, when a gentle uniform wind is blowing, is approximately a straight line.

This whole subject lends itself to beautiful laboratory experiments, and the Editor hopes soon to present in the MONTHLY WEATHER REVIEW a very full account of the important experimental methods first invented by Toepler, but perfected by E. Mach and his students at Vienna, for the study of the flow of air around any obstacle, a method that is peculiarly adapted to the study of falling drops. The hydrodynamic formula deduced by Stokes for the viscous resistance to falling spheres does not apply rigorously to the shapes assumed by these liquid drops.

ATMOSPHERIC ELECTRICITY—BRILLOUIN'S THEORY.

The progress of meteorology—like that of all the other sciences—depends much less upon chance discoveries or hasty suggestions than it does upon the wisdom and sagacity of its devotees. The progress of the past two centuries has been marked by the overthrow or complete remodeling of many so-called theories which now seem to us crude, but which in their day represented the best that was known. An immense body of truth is contained in the hundred thousand volumes of experimentation, observation, and mathematics that are preserved in the great scientific libraries, and no one can at the present day afford to disregard the work of his predecessors, or even provisionally give credence to any theory that flies in the face of the facts and principles that constitute modern science. We are all engaged in the study of Nature and shall not make any advance therein, except as we confine ourselves closely to the laws that are manifested in the material creation around us. Owing to the slow progress of our knowledge of electricity we have, until within the past ten years, been completely in the dark as to the origin of atmospheric electricity, earth currents, terrestrial magnetism, and cognate phenomena. Indeed, it is not at all evident that even now we have got at anything very satisfactory. We have, therefore, not encouraged many publications upon this subject in the MONTHLY WEATHER REVIEW. A few years ago Hallwachs showed that the radiation from the sun facilitated electric discharges or neutralized the electrified state of the air, and upon this Arrhenius formulated the theory that the illumination of the air by the sunshine lay at the base of all our phenomena of atmospheric electricity. Since the discoveries of Hertz, Lenart, and Röntgen, the subject has been rapidly developed and Arrhenius' idea has now been further elaborated by Brillouin; although in many respects the theory developed by him in the article that we have reprinted in the current number of the MONTHLY WEATHER REVIEW seems unsatisfactory, yet it has enough of truth and reason to justify calling to it the attention of the students of physics in the United States. Meanwhile, however, the subject of atmospheric electricity is one that demands elaborate observation of facts before we proceed to hypotheses as to its ultimate cause. An admirable summary of our knowledge of the sub-

ject, prepared by Elster and Geitel, will be found in Part II of the Report of the International Meteorological Congress at Chicago, 1893.

HURRICANES IN THE WEST INDIES.

From Jos. Ridgway, Jr., St. Thomas, W. I., the Weather Bureau has received the following note, dated October 29:

> Thirty years ago we experienced here, on this date, the most severe hurricane ever known in these latitudes. Apparently there is now no further fear of hurricanes for the season 1897, but I may mention as a peculiar feature that on different occasions since the 15th instant the barometer has been lower than at any time during the period 15th July to 15th October.

ALTITUDES OF CLOUDS.

The well-known voluntary observer, Mr. Barry C. Hawkins, of Horse Cove station, near Highlands, Macon Co., N. C., requests information with regard to the best methods of determining the altitudes of clouds, applicable to the case where the observer is on a mountain or plateau so high that he is sometimes within the cloud. Under date of November 7 he writes:

> In mountain regions the altitudes of clouds are not nearly as great as near the sea level, the relation of the observer to the clouds being entirely changed. For instance, the altitude of a cloud near sea level might be 3,000 feet, the same kind of cloud when passing over a mountain range or plateau 3,000 feet high would touch the earth. Such is the actual case in the Blue Ridge Mountains. In storms the clouds frequently sweep the ground, and at other times the height varies from 0 to 500, 800, or 1,000 feet. When touching the earth the cloud appears like fog and might be called fog, but really the case is entirely different, for the origin is like that of all clouds, and the velocity is often great, being equal to that of the surface winds. When the cloud is dense one can only see a few rods. How can we draw a sharp distinction between such clouds and fogs? It is to be noted that cirrus, cirro-stratus, and rarely cumulus are so low in altitude. The clouds of thunderstorms, which are well developed and not connected with any general storm, rarely touch the mountain, peaks of 4,500 feet or more being free from them. But after thunderstorms small clouds, sometimes not more than 10 feet in diameter, will form perhaps only a few feet above the surface and float in various directions with various velocities, but as the atmosphere clears they disappear. I have sometimes used the following method for obtaining the height of general cloud sheets. Suppose an observer is at an altitude of 2,000 feet and sees a cloud sheet touch the summit of a mountain known to be 3,000 feet high. The altitude of the cloud above will equal 3,000—2,000 = 1,000 feet. Ought such altitudes to be counted as above the observer or as above the sea level?

The altitudes of clouds, as published in connection with the international charts of cloud types are given as above sea level, and this is always to be understood when speaking of clouds unless specifically stated to the contrary. Measurements of clouds are made from elevated points, and in publishing such results, both the measured and the sea level altitudes should be given.

The methods of observation and measurement are so varied that students of the subject should refer to the chapters on this subject in the Editor's Meteorological Apparatus and Methods, Washington, 1887, as also to the articles in the MONTHLY WEATHER REVIEW for April, 1897. The method described by Mr. Hawkins is perfectly proper, and in fact is the one first used by meteorologists in the beginning of the study of this subject; it is quite accurate when there are many clouds whose lower sides are all on the same level, so that an observer by ascending or descending a mountain slope may determine to within a very few yards whether he is on the right level or not. Of course, the actual result depends equally upon the accuracy with which one knows the elevations of his position on the mountain side. This latter consideration is perhaps the most important one when an observer looks upward from below and tries to ascertain at what level the base of the cloud intersects the mountain side. The low clouds that sometimes hang over the city of Washington often hide the summit of the Washington Monument, 550 feet above the ground or 600 feet above sea level, but owing to the absence of a sufficient number of well-defined marks on the side of the Monument, as well as to the haziness of the cloud, it is rarely possible to determine the altitude of the base of the cloud to within 50 feet. In the case of observers on the broad plains of the Mississippi watershed it is important that they give the heights of clouds above sea level as well as above ground, since, in general, the types and motions of the clouds depend equally upon the pressure, the temperature, and the moisture of the atmosphere.

ORIGIN OF THE DESCENDING GUSTS OF WIND.

In the MONTHLY WEATHER REVIEW for August, page 351, the Editor has ventured a few words in connection with an extract from a letter of Mr. Charles A. Love, of Aurora, Ill., who now writes that perhaps the wording of his letter has been misunderstood by the Editor, and that he himself had no idea of suggesting that hail causes the wind, but, on the contrary, that cold, dry wind causes the hail. He intended mainly to raise the question as to—

> Whether it is possible for a stratum of cold, dry air to get between an upper and lower rain cloud and freeze the rain which is falling from the upper cloud. Is it possible for a stratum of cold air, of relatively greater density, to overlap the warmer air at the surface and cause a downrush and at the same time freeze rain into hail, if there should be any rain in the path of the descending cold air? It is often said that a hailstorm in a certain locality is the cause of the cold, although the hailstorm is of limited area and the change to cold weather covers a wide area. The cold air causes the hail and not the hail the cold air.

The Editor owes Mr. Love an apology for reading too much meteorology into his former letter. The fact is, as we understand it, that when a great mass of cool, dry, and, therefore, denser air rolls southeastward over the continent, displacing warmer, moister air, the process does produce thundershowers and hailstorms, and still oftener raw, cold gusts without much rain or hail. It is, therefore, not proper to say that hailstorms or thunderstorms produced this spell of cool weather, since it was the cold air that caused them, and to this extent our correspondent is quite correct.

Denser air can not lie quietly above lighter air near the earth's surface for any length of time, but if the former is in rapid motion, as is oftentimes the case, bounding along over the earth's surface like the ricochet of a cannon ball, it must necessarily descend in gusts here and there precisely as observed by Mr. Love. At other times the word *ricochet* does not correctly express the movement, since sometimes the cold wind blows against an obstacle or blows from hilltop to hilltop over a valley before it has time to descend. The descent is usually slow as compared with the horizontal movement.

But there is another equally frequent case in which it is not the cold air that forms the hail, but the hail and rain that forms the cold gust. This latter case is due to two very different modes of action. The first, or simplest of comprehension, is a simple mechanical process; the descending raindrops or hailstones, by the momentum of their fall and the viscosity or internal friction of the air, drive some air before them, so that beneath the column of falling rain the air is pushed outward in all directions, especially southeastward, in the line of least resistance. The second is a thermodynamic action; the falling rain or hail, no matter whether it is entering warmer air or whether it is driving in front of it air that becomes warm by compression, is in either case being evaporated, and as this evaporation consumes heat (i. e., renders it latent), therefore, the rain, the hail, and the air are each cooled in proportion to the quantity of heat that they give up to the process of evaporation; of course the air in the region at a distance from the falling hail is not cooled. The heavy, cold air thus formed descends with the rain and,

striking the earth, is pushed outward in all directions as a cold gust. Not only rain and hail, but every collection of small particles of water constituting a fog or cloud cools the air into which it is allowed to evaporate. If, therefore, a layer of dry air is flowing over a layer of cloudy air, the mixture of the dry air with the cloud and the consequent evaporation of the cloud into it will always produce a mixture, or a resulting moister air, that is sufficiently cold to fall rapidly downward. These mixtures of masses of air having different temperatures and moistures are those treated of by Brillouin in a memoir which is published on an earlier page of this REVIEW; they constitute the ordinary phenomena of cloudy weather. Knowing the pressure, temperature, moisture, and movement of the two masses of air, we should be able to predict the cloud phenomena, and *vice versa;* knowing the clouds, we must learn to infer something as to the temperature and other conditions of the air.

RECENT EARTHQUAKES.

With regard to the seismograph kept in operation at Adelbert College, Cleveland, Ohio, by Prof. E. W. Morley, he reports that no disturbances were recorded during the month of October. With regard to its sensibility he notes that—

> The instrument is one that records on smoked glass the horizontal components of any earth tremor and it would not be easy to alter the construction of the lever which determines the ratio of the trace to the original motion.

October 2, 8:42 a. m., shocks were felt at San Francisco; 8:45, Alma and Santa Cruz, Cal.

On October 21 an earthquake shock was felt at 10:20 p. m., at Salem, Va.; 10:30 p. m., Wytheville, Va., preceded by a rumble; 10:30 p. m., Winston, N. C., two waves in close succession. At Washington, D. C., the Marvin seismograph recorded earthquake shocks at 10:25 p. m., and frequently between 10:25:40 and 10:26:40.

DISTANT CLOUD BANKS.

For many years the Editor has been accustomed to keep notes and diagrams of the banks of clouds that are often seen low down in the distant horizon. The easiest way of making the record is pictorial, using a small circle with north, south, east, west lines intersecting at the center. On this circle the symbols and arrows showing the movements of clouds can easily be located, a full line to indicate the lowest wind; a dashed line, the lower clouds; a dotted line, the upper clouds. Whenever a cloudy area approaches from the west, the bank of clouds appears from one to twelve hours earlier in the distant horizon. Whenever a hurricane passes up the coast, perhaps even entirely at sea, the observer at Washington notices first a cloud bank having its maximum altitude in the south-southeast, subsequently in the southeast, and finally disappearing in the northeast. Such observations and records go a long way to eke out the information given by the morning weather map. For instance, on Monday, October 4, 8 a. m., Hatteras reported a northeast wind of 32 miles, threatening weather, and falling barometer. Over the rest of the Middle Atlantic States northerly winds and clear weather prevailed. At Washington the cloud bank was observed to have its maximum altitude of about 10° in the southeast; the upper edge of the bank cut the horizon at the points south-southeast and east-northeast, and seemed to indicate the presence of a storm area fully 500 miles away.

METEOROLOGICAL TABLES.

By A. J. HENRY, Chief of Division of Records and Meteorological Data.

Table I gives, for about 130 Weather Bureau stations making two observations daily and for about 20 others making only the 8 p. m. observation, the data ordinarily needed for climatological studies, viz, the monthly mean pressure, the monthly means and extremes of temperature, the average conditions as to moisture, cloudiness, movement of the wind, and the departures from normals in the case of pressure, temperature, and precipitation; the altitudes of the instruments, the total depth of snowfall, and the mean wet-bulb temperatures are now given.

Table II gives, for about 2,400 stations occupied by voluntary observers, the extreme maximum and minimum temperatures, the mean temperature deduced from the average of all the daily maxima and minima, or other readings, as indicated by the numeral following the name of the station; the total monthly precipitation, and the total depth in inches of any snow that may have fallen. When the spaces in the snow column are left blank it indicates that no snow has fallen, but when it is possible that there may have been snow of which no record has been made, that fact is indicated by leaders, thus (....).

Table III gives, for about 30 Canadian stations, the mean pressure, mean temperature, total precipitation, prevailing wind, total depth of snowfall, and the respective departures from normal values. Reports from Newfoundland and Bermuda are included in this table for convenience of tabulation.

Table IV gives detailed observations at Honolulu, Republic of Hawaii, by Curtis J. Lyons, meteorologist to the Government Survey.

Table V gives, for 26 stations, the mean hourly temperatures deduced from thermographs of the pattern described and figured in the Report of the Chief of the Weather Bureau, 1891–92, p. 29.

Table VI gives, for 26 stations, the mean hourly pressures as automatically registered by Richard barographs, except for Washington, D. C., where Foreman's barograph is in use. Both instruments are described in the Report of the Chief of the Weather Bureau, 1891–92, pp. 26 and 30.

Table VII gives, for about 130 stations, the arithmetical means of the hourly movements of the wind ending with the respective hours, as registered automatically by the Robinson anemometer, in conjunction with an electrical recording mechanism, described and illustrated in the Report of the Chief of the Weather Bureau, 1891–92, p. 19.

Table VIII gives, for all stations that make observations at 8 a. m. and 8 p. m., the four component directions and the resultant directions based on these two observations only and without considering the velocity of the wind. The total movement for the whole month, as read from the dial of the Robinson anemometer, is given for each station in Table I. By adding the four components for the stations comprised in any geographical division one may obtain the average resultant direction for that division.

Table IX gives the total number of stations in each State from which meteorological reports of any kind have been received, and the number of such stations reporting thunderstorms (T) and auroras (A) on each day of the current month.

Table X gives, for 56 stations, the percentages of hourly sunshine as derived from the automatic records made by two essentially different types of instruments, designated, respectively, the thermometric recorder and the photographic

recorder. The kind of instrument used at each station is indicated in the table by the letter T or P in the column following the name of the station.

Table XI gives a record of rains whose intensity at some period of the storm's continuance equaled or exceeded the following rates:

Duration, minutes..	5	10	15	20	25	30	35	40	45	50	60	80	100	120
Rates pr. hr. (ins.)..	3.00	1.80	1.40	1.20	1.08	1.00	0.94	0.90	0.86	0.84	0.75	0.60	0.54	0.50

In the northern part of the United States, especially in the colder months of the year, rains of the intensities shown in the above table seldom occur. In all cases where no storm of sufficient intensity to entitle it to a place in the full table has occurred, the greatest rainfall of any single storm has been given, also the greatest hourly fall during that storm.

Table XII gives the record of excessive precipitation at all stations from which reports are received.

NOTES EXPLANATORY OF THE CHARTS.

Chart I.—Tracks of centers of high pressure. The roman letters show number and order of centers of high areas. The figures within the circles show the days of the month; the letters *a* and *p* indicate, respectively, the 8 a. m. and 8 p. m., seventy-fifth meridian time, observations. The queries (?) on the tracks show that the centers could not be satisfactorily located. Within each circle is given the highest barometric reading reported near the center. A blank indicates that no reports were available. A wavy line indicates the axis of a ridge of high pressure.

Chart II.—Tracks of centers of low pressure. The roman letters show number and order of centers of low areas. The figures within the circles show the days of the month; the letters *a* and *p* indicate, respectively, the 8 a. m. and 8 p. m., seventy-fifth meridian time, observations. The queries (?) on the tracks show that the centers could not be satisfactorily located. Within each circle is given the lowest barometric reading reported near the center. A blank indicates that no reports were available. A wavy line indicates the axis of a trough or long oval area of low pressure.

Chart III.—Total precipitation. The scale of shades showing the depth of rainfall is given on the chart itself. For isolated stations the rainfall is given in inches and tenths, when appreciable; otherwise, a "trace" is indicated by a capital T, and no rain at all, by 0.0.

Chart IV.—Sea-level isobars, surface isotherms, and resultant winds. The wind directions on this Chart are the computed resultants of observations at 8 a. m. and 8 p. m., daily; the resultant duration is shown by figures attached to each arrow. The temperatures are the means of daily maxima and minima and are not reduced to sea level. The pressures are the means of 8 a. m. and 8 p. m. observations, daily, and correspond to Professor Hazen's system of reduction; the barometer is not reduced to standard gravity, but the necessary reduction for 30 inches of the mercurial barometer is shown by the marginal figures for each degree of latitude.

Chart V.—Hydrographs for seven principal rivers of the United States.

Chart VI.—Depth of snow on ground at the close of the month.

TABLE I.—*Climatological data for Weather Bureau Stations, October, 1897.*

Stations.	Elevation of instruments.			Pressure, in inches.			Temperature of the air, in degrees Fahrenheit.												Precipitation, in inches.			Wind.									
	Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Mean actual, 8 a.m. and 8 p.m. ÷ 2.	Mean reduced.	Departure from normal.	Mean max. and min. ÷ 2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.	Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Total.	Departure from normal.	Days with .01, or more.	Total movement, miles.	Prevailing direction.	Maximum velocity. Miles per hour.	Maximum velocity. Direction.	Maximum velocity. Date.	Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.
New England.							52.4	+ 1.6											1.29	− 2.7											
Eastport	76	69	74	30.03	30.12	+ .11	48.4	+ 2.1	74	1	56	29	10	41	33	44	40	80	0.61	− 3.5	6	7,031	sw.	48	nw.	17	15	7	9	4.7	
Portland, Me	103	81	89	30.01	30.12	+ .08	50.0	+ 3.0	84	15	59	28	31	41	32	44	40	72	0.46	− 3.4	6	5,527	nw.	32	nw.	17	17	8	6	3.8	
Northfield	872	15	59	29.22	30.17	+ .13	45.6	+ 1.5	82	15	60	18	31	31	50	39	36	77	1.16	− 1.2	7	6,217	s.	44	nw.	17	14	10	7	4.4	
Boston	125	115	181	30.03	30.16	+ .10	54.4	+ 2.9	88	16	63	32	31	46	37	48	43	70	0.41	− 3.9	3	8,093	nw.	38	nw.	17	17	5	9	4.1	
Nantucket	14	43	54	30.14	30.15	+ .07	54.7	+ 0.9	72	16	59	38	31	50	21	51	49	82	1.63	− 2.3	8	9,814	ne.	49	ne.	21	11	12	8	5.2	
Woods Hole	...	51	57	...	...	...	54.0	+ 0.4	77	16	60	36	31	48	20	...	...	...	1.92	− 2.1	5	10,565	ne.	46	nw.	17	21	1	9	3.4	
Vineyard Haven	...	20	...	...	...	...	56.0	+ 2.9	80	1	63	35	31	48	26	...	...	...	2.44	− 2.1	5	...	ne.	...	...	...	14	7	10	...	
Block Island	27	39	48	30.13	30.16	+ .05	55.0	+ 0.7	75	1	60	38	30	50	18	51	48	80	1.83	− 2.6	7	13,713	ne.	59	ne.	21	15	9	7	4.2	
Narragansett Pier	...	10	...	...	...	...	52.8	+ 0.5	82	1	62	30	*	44	31	...	...	...	1.23	− 3.5	5	...	ne.	...	...	...	21	2	8	...	
New Haven	107	118	140	30.04	30.16	+ .08	53.4	+ 1.1	86	1	63	30	31	44	34	47	43	72	1.25	− 2.8	9	7,216	ne.	35	ne.	21	16	4	11	4.3	
Mid. Atlan. States.							58.5	+ 1.4											3.31	0.0											
Albany	97	84	113	30.07	30.18	+ .11	53.0	+ 1.7	88	16	64	28	31	42	38	46	43	80	1.01	− 2.2	7	4,573	s.	28	se.	12	16	11	4	3.9	
Binghamton	875	79	90	...	...	...	51.0	...	87	16	64	25	10	39	44	...	...	...	0.66	...	7	3,999	e.	25	s.	11	14	11	6	4.7	
New York	314	298	326	29.82	30.16	+ .07	56.3	+ 0.3	86	16	64	37	31	49	27	50	46	73	0.72	− 2.8	10	9,960	ne.	60	nw.	17	14	7	10	5.0	
Harrisburg	377	94	102	29.76	30.18	+ .09	56.1	+ 3.6	86	16	66	34	31	47	33	49	44	70	1.35	− 1.7	6	4,491	e.	30	ne.	25	11	9	11	5.5	
Philadelphia	117	168	184	30.03	30.15	+ .04	58.2	+ 1.6	88	16	67	39	31	50	27	51	47	72	1.70	− 1.2	8	7,978	ne.	44	ne.	25	13	4	14	5.3	
Atlantic City	52	68	76	30.09	30.14	+ .05	57.4	+ 1.1	86	1	64	40	*	51	27	54	52	84	2.21	− 1.1	10	10,275	ne.	53	ne.	25	12	7	12	5.3	
Baltimore	123	68	82	30.01	30.14	+ .03	58.2	+ 0.2	90	16	67	38	18	50	30	52	48	74	3.67	+ 0.7	12	4,136	n.	25	ne.	25	11	8	12	5.4	
Washington	112	59	76	30.03	30.15	+ .03	58.0	+ 0.7	89	16	68	34	31	49	35	52	49	81	3.55	+ 0.5	11	4,697	ne.	30	n.	25	12	8	11	5.2	
Cape Henry	...	5	34	...	...	...	64.0	+ 1.0	83	*	69	51	30	59	29	...	...	...	7.11	+ 3.3	10	...	ne.	...	...	...	11	0	20	...	
Lynchburg	685	83	88	29.40	30.15	+ .04	60.2	+ 1.9	92	1	71	36	31	49	43	53	49	78	3.12	− 0.1	9	2,733	ne.	23	n.	25	15	5	11	4.8	
Norfolk	57	88	93	30.04	30.10	− .01	63.5	+ 1.5	85	1	70	46	31	57	31	59	57	86	8.70	+ 4.8	12	6,568	ne.	38	nw.	25	12	4	15	5.6	
S. Atlantic States.							66.7	+ 1.5											5.50	+ 1.5											
Charlotte	773	68	76	29.29	30.10	− .01	64.2	+ 3.2	89	2	74	42	30	54	31	55	50	70	1.39	− 2.3	6	4,999	ne.	26	ne.	2	13	6	12	4.8	
Hatteras	11	17	86	30.05	30.06	− .03	66.3	+ 1.0	76	*	70	53	25	63	16	64	62	87	9.83	+ 3.7	9	10,201	ne.	56	n.	24	13	8	10	4.9	
Kittyhawk	9	12	30	30.04	30.05	− .01	64.6	+ 0.2	79	*	70	44	25	60	22	63	61	89	12.29	+ 8.6	7	13,435	ne.	60	ne.	24	12	7	12	5.6	
Raleigh	375	93	101	29.72	30.12	+ .01	63.0	+ 2.8	89	1	72	43	31	54	35	56	53	77	2.62	− 2.3	12	5,260	n.	26	n.	25	11	10	10	5.4	
Wilmington	78	82	90	29.99	30.08	− .02	65.9	+ 1.2	86	2	74	48	24	58	27	61	59	86	4.44	+ 0.6	10	6,438	n.	27	ne.	17	12	13	6	4.7	
Charleston	48	60	72	30.04	30.09	− .01	69.6	+ 1.9	84	12	75	55	25	64	18	64	61	78	7.04	+ 2.9	7	9,095	n.	41	ne.	17	7	15	9	5.5	
Columbia	...	5	...	...	...	...	66.0	+ 1.9	91	2	76	45	31	56	34	...	...	...	1.87	− 0.5	5	...	ne.	...	...	...	12	9	10	...	
Augusta	180	89	103	29.89	30.08	− .01	66.9	+ 1.2	90	2	77	46	30	57	35	60	57	81	2.62	+ 0.1	6	4,502	ne.	24	ne.	18	16	9	6	3.8	
Savannah	87	63	86	29.98	30.08	− .03	69.2	+ 1.5	88	7	77	52	30	62	24	63	62	85	6.87	+ 3.2	6	6,426	n.	30	ne.	18	15	7	9	4.8	
Jacksonville	43	69	84	29.99	30.04	− .03	71.7	+ 0.2	89	12	79	54	25	64	23	66	64	86	6.00	+ 0.8	10	5,407	ne.	30	ne.	16	14	8	9	5.2	
Florida Peninsula.							75.6	− 1.3											7.26	+ 1.6											
Jupiter	28	13	30	29.95	29.98	− .02	74.6	− 3.1	84	12	80	59	25	69	17	71	69	83	9.93	+ 0.7	17	9,156	e.	37	ne.	15	11	8	12	5.5	
Key West	22	42	50	29.96	29.98	− .01	78.5	− 0.5	86	10	82	70	19	75	13	72	70	76	7.08	+ 1.8	15	7,190	e.	36	ne.	15	15	12	4	3.9	
Tampa	36	60	67	29.98	30.02	− .03	73.6	− 0.2	88	12	81	56	31	66	24	67	64	80	4.78	+ 2.3	8	4,845	ne.	34	se.	10	17	11	3	3.4	
East Gulf States.							71.3	+ 3.0											2.10	− 0.9											
Atlanta	1,131	92	126	28.92	30.11	− .03	66.2	+ 4.0	88	6	76	45	30	56	30	57	52	68	1.80	− 0.4	5	6,270	ne.	34	ne.	18	20	7	4	2.9	
Pensacola	56	78	90	30.00	30.06	− .02	72.4	+ 2.7	90	3	80	50	30	65	26	66	63	76	1.33	− 2.0	5	6,651	ne.	37	s.	31	18	6	7	3.7	
Mobile	57	88	96	30.00	30.06	− .02	70.8	+ 2.1	90	3	81	49	26	61	32	63	60	76	2.12	− 1.3	7	4,560	n.	31	se.	31	16	6	9	4.4	
Montgomery	221	100	107	29.83	30.06	− .04	69.6	+ 2.6	92	6	81	46	30	58	35	60	54	66	0.55	− 1.8	4	4,285	e.	27	e.	18	19	9	3	2.9	
Vicksburg	254	65	73	29.77	30.03	− .08	71.2	+ 4.2	93	3	81	45	30	61	31	61	56	66	1.94	− 0.7	2	4,163	se.	18	sw.	11	18	9	4	3.1	
New Orleans	54	112	120	29.98	30.04	− .02	74.4	+ 3.7	89	6	82	59	30	67	22	66	62	74	2.70	− 0.5	6	5,284	ne.	24	ne.	18	17	7	7	4.1	
Port Eads	...	27	...	...	...	...	74.8	+ 1.6	84	7	79	63	*	70	15	...	...	...	4.26	+ 0.4	9	8,496	ne.	...	...	...	8	15	8	5.5	
West Gulf States.							72.0	+ 4.1											2.96	+ 0.2											
Shreveport	249	77	84	29.77	30.03	− .06	71.6	+ 4.6	93	3	84	43	29	60	35	60	55	66	3.67	+ 0.6	6	3,928	se.	30	s.	10	22	4	5	2.6	
Fort Smith	481	63	72	29.52	30.03	− .05	67.9	+ 5.2	92	3	82	35	30	54	38	57	52	68	1.17	− 1.6	4	3,738	e.	16	e.	26	17	9	5	3.3	
Little Rock	302	71	79	29.74	30.06	− .04	69.3	+ 5.6	93	3	82	42	30	56	35	58	52	64	1.95	− 0.5	5	3,621	ne.	30	nw.	31	20	8	3	2.8	
Corpus Christi	20	42	50	29.99	30.01	− .06	74.8	+ 1.8	90	6	80	55	*	69	27	70	68	83	3.79	+ 1.6	10	8,080	se.	36	n.	22	17	6	8	4.0	
Galveston	42	85	96	29.96	30.00	− .07	75.9	+ 3.4	91	6	80	56	29	72	21	70	67	79	5.12	+ 0.9	7	7,886	se.	33	n.	21	18	6	7	3.8	
Palestine	510	54	61	29.48	30.03	− .06	71.7	+ 5.0	94	6	84	44	29	60	35	61	57	72	3.65	+ 0.4	8	3,660	ne.	26	nw.	31	17	8	6	4.1	
San Antonio	704	95	104	29.28	30.01	− .06	72.6	+ 3.4	92	6	83	46	29	63	27	62	57	66	1.35	− 0.3	6	5,784	se.	32	n.	27	14	11	6	4.0	
Ohio Val. & Tenn.							63.3	+ 5.5											0.99	− 1.7											
Chattanooga	762	106	112	29.31	30.11	− .02	65.4	+ 3.7	89	2	78	39	30	52	37	56	50	69	3.33	+ 0.6	4	3,420	nw.	30	se.	10	23	5	3	2.5	
Knoxville	1,004	80	88	29.06	30.12	− .02	63.3	+ 3.6	87	*	77	36	30	50	37	54	50	73	1.97	− 0.8	8	3,680	ne.	32	e.	10	23	3	5	2.5	
Memphis	399	140	154	29.65	30.07	− .04	69.8	+ 6.8	91	3	80	44	29	60	27	58	50	58	1.00	− 1.8	4	5,743	n.	23	se.	18	20	7	4	3.4	
Nashville	545	128	134	29.51	30.08	− .02	66.4	+ 5.7	90	3	80	36	30	53	38	54	47	61	0.92	− 1.6	4	3,444	nw.	26	se.	11	25	2	4	1.8	
Lexington	989	75	122	29.04	30.09	+ .01	63.9	+ 6.7	88	15	76	36	30	52	37	52	43	56	0.38	− 2.1	6	6,618	sw.	30	sw.	11	23	3	5	2.4	
Louisville	525	114	136	29.53	30.10	− .01	64.8	+ 5.5	91	15	77	38	30	53	37	53	46	61	1.83	− 1.0	5	4,939	n.	28	sw.	10	21	6	4	2.5	
Indianapolis	823	154	164	29.23	30.11	+ .01	61.2	+ 7.2	89	1	73	37	*	50	42	51	45	63	0.45	− 2.4	5	6,301	ne.	36	sw.	11	21	6	4	2.9	
Cincinnati	628	152	157	29.44	30.11	+ .01	62.6	+ 5.6	88	1	74	39	30	51	38	53	48	65	0.46	− 2.0	5	4,205	ne.	30	sw.	11	24	4	3	2.1	
Columbus	824	87	100	29.23	30.10	+ .01	59.8	+ 5.8	90	15	72	34	30	47	41	50	45	66	0.36	− 2.3	3	4,841	ne.	25	nw.	11	18	7	6	3.5	
Pittsburg	842	116	123	29.23	30.13	+ .04	59.2	+ 3.9	87	15	70	38	30	48	38	51	45	68	0.13	− 2.3	2	3,886	e.	32	s.	11	11	16	4	4.5	T.
Parkersburg	638	77	84	29.44	30.13	+ .05	59.8	+ 5.5	90	15	74	30	30	46	45	50	44	67	0.07	− 3.0	2	3,488	s.	24	s.	11	22	3	6	2.7	
Lower Lake Region.							55.5	+ 4.0											0.92	− 2.2											
Buffalo	768	178	206	29.29	30.11	+ .06	54.4	+ 4.1	76	3	63	33	*	46	33	48	42	67	0.80	− 2.8	8	9,585	sw.	47	sw.	12	6	14	11	6.3	T.
Oswego	335	76	87	29.75	30.12	+ .06	52.3	+ 3.0	81	15	61	31	10	43	34	46	41	69	0.51	− 2.8	8	7,920	se.	36	s.	11	14	8	9	4.4	
Rochester	523	81	90	29.55	30.12	+ .06	53.6	+ 4.1	86	15	64	31	10	43	38	46	41	72	0.97	− 2.0	8	5,201	sw.	29	sw.	12	8	11	12	5.9	T.
Erie	714	92	102	29.35	30.12	+ .06	55.4	+ 3.1	82	14	64	35	18	47	31	49	44	69	1.24	− 2.9	5	8,338	s.	36	s.	10	13	12	6	5.1	
Cleveland	762	190	201	29.28	30.10	+ .02	57.2	+ 4.5	85	15	66	36	18	48	34	49	43	66	1.32	− 1.6	4	11,037	se.	47	n.	7	7	15	9	5.4	
Sandusky	629	62	74	29.42	30.10	+ .02	58.2	+ 4.9	88	15	67	37	23	49	37	50	45	68	0.43	− 2.3	5	6,097	sw.	36	n.	7	7	13	11	5.6	
Toledo	674	122	127	29.38	30.10	+ .04	56.8	+ 4.5	90	1	66	39	29	47	37	49	44	71	0.75	− 1.7	6	6,772	e.	30	sw.	11	9	14	8	4.9	
Detroit	730	160	166	29.32	30.10	+ .04	56.0	+ 3.7	88	1	65	37	18	47	32	49	45	75	1.31	− 1.2	6	6,346	ne.	35	s.	11	13	11	7	4.7	
Upper Lake Region.							52.4	+ 5.1											2.32	− 0.7											
Alpena	609	61	65	29.42	30.08	+ .05	50.8	+ 5.5	84	15	58	33	10	44	33	47	45	87	4.33	+ 0.5	12	6,843	se.	31	nw.	16	6	14	11	6.0	T.
Grand Haven	628	55	64	29.38	30.06	+ .03	53.5	+ 4.2	79	4	63	33	31	44	31	48	44	77	1.28	− 1.9	8	6,109	e.	30	nw.	12	11	11	9	5.0	
Marquette	734	67	95	29.22	30.01	+ .01	49.8	+ 4.8	82	4	56	30	29	44	28	46	43	85	2.68	− 0.6	16	7,447	s.	39	sw.	8	5	9	17	7.1	1.1
Port Huron	639	70	108	29.41	30.11	+ .06	54.6	+ 5.3	87	15	64	34	29	45	30	48	44	77	2.25	− 0.5	8	7,235	s.	36	sw.	11	17	8	6	4.2	
Sault Ste. Marie	624	58	65	29.38	30.05	+ .06	47.0	+ 3.3	78	14	53	26	29	41	29	44	42	86	4.48	+ 1.0	12	6,569	se.	44	nw.	8	6	4	21	7.3	0.1
Chicago	824	241	274	29.20	30.08	+ .03	58.4	+ 6.2	87	15	65	38	29	51	26	51	45	66	0.18	− 2.8	1	12,436	se.	47	sw.	14	20	7	4	2.9	
Milwaukee	671	106	149	29.35	30.07	+ .03	56.2	+ 6.4	88	4	64	34	29	48	34	50	45	72	1.05	− 1.3	4	7,130	se.	32	sw.	14	7	15	9	5.5	
Greenbay	617	49	57	29.39	30.06	.00	52.9	+ 5.9	82	15	61	32	29	45	30	47	43	77	2.50	0.0	9	5,154	s.	30	nw.	5	9	12	10	5.4	
Duluth	702	95	106	29.24	30.01	+ .01	48.6	+ 4.1	74	3	54	29	9	43	26	44	41	79	2.11	− 0.5	12	6,819	ne.	35	nw.	26	5	16	10	6.2	T.
North Dakota.							47.7	+ 4.4											0.90	− 0.4											
Moorhead	935	54	60	28.97	30.00	.00	48.4	+ 5.9	90	2	60	16	9	37	43	42	39	79	1.84	− 0.1	10	7,595	se.	45	se.	13	14	5	12	5.4	
Bismarck	1,674	16	29	28.22	30.02	+ .02	47.2	+ 3.2	89	1	60	13	9	35	39	39	32	66	0.42	− 0.6	5	7,152	nw.	39	nw.	11	15	8	8	4.7	3.0
Williston	1,875	15	31	27.98	29.99	− .02	47.6	+ 4.1	93	1	60	17	9	35	38	38	30	60	0.43	− 0.6	2	6,508	nw.	42	w.	2	15	13	3	3.8	T.
Upper Miss. Valley.							59.3	+ 6.6											0.77	− 1.8											
Minneapolis	...	99	...	...	...	...	53.4	+ 4.6	86	1	62	31	9	45	31	...	...	...	1.67	− 0.1	8	...	nw.	...	...	...	8	11	12	...	
St. Paul	837	114	124	29.11	30.02	+ .01	53.0	+ 5.5	85	1	61	30	9	44	31	46	41	71	1.87	0.0	7	5,669	nw.	27	se.	13	9	11	11	5.9	
La Crosse	...	70	78	...	...	...	55.2	+ 5.7	88	14	66	28	17	45	39	...	...	...	0.30	− 1.9	3	5,118	s.	29	nw.	28	12	13	6	4.9	
Davenport	599	71	79	29.40	30.04	− .03	59.2	+ 7.0	90	3	70	32	29	48	35	49	42	63	0.35	− 2.3	2	4,756	e.	23	sw.	14	15	9	7	4.0	
Des Moines	867	84	88	29.13	30.06	.00	58.6	+ 6.8	90	1	71	30	29	46	37	48	42	62	0.85	− 2.2	5	5,339	sw.	36	sw.	14	17	7	7	4.0	
Dubuque	698	49	56	29.30	30.05	.00	57.4	+ 6.6	89	4	69	32	17	46	38	50	45	71	1.02	− 1.7	4	4,506	se.	28	nw.	5	21	5	5	2.8	
Keokuk	614	64	78	29.40	30.06	− .01	61.8	+ 7.8	92	1	73	33	29	50	38	50	43	60	0.24	− 2.5	2	4,808	se.	20	s.	14	21	5	5	2.4	
Cairo	359	87	93	29.68	30.07	− .02	66.0	+ 6.3	90	3	78	38	30	54	33	57	52	72	0.91	− 1.8	4	4,089	ne.	36	s.	10	19	9	3	3.2	

TABLE I.—*Climatological data for Weather Bureau Stations, October, 1897*—Continued.

Stations.	Elevation of instruments			Pressure, in inches.			Temperature of the air, in degrees Fahrenheit.									Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches.			Wind.					Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.
	Barometer above sea level, feet.	Thermometers above ground.	Anemometers above ground.	Mean actual, 8 a. m. and 8 p. m. ÷ 2.	Mean reduced.	Departure from normal.	Mean max. and min. ÷ 2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.				Total.	Departure from normal.	Days with .01, or more.	Total movement, miles.	Prevailing direction.	Maximum velocity. Miles per hour.	Maximum velocity. Direction.	Maximum velocity. Date.					
Up. Miss. Val.—Con																															
Springfield, Ill.	644	82	92	29.38	30.07	− .02	62.4	+ 7.4	91	*	74	34	29	50	36	50	42	57	0.52	− 2.2	2	5,897	nw.	24	s.	14	23	4	4	2.5	
Hannibal	534	75	107	......	......	......	62.4	......	91	1	75	33	29	50	40	...	...	...	0.45	− 2.0	3	5,744	sw.	28	sw.	14	23	4	4	2.5	
St. Louis	567	110	210	29.47	30.08	.00	66.3	+ 8.3	91	5	77	42	29	50	33	54	46	55	0.31	− 2.6	2	5,802	s.	26	n.	16	24	3	4	2.3	
Missouri Valley.							58.8	+ 5.4											1.41	− 0.4											
Columbia	......	4	84	......	......	......	64.1	+ 7.2	94	*	80	27	29	49	46	...	...	...	0.69	− 0.7	4	5,300	s.	24	sw.	14	19	7	5	3.3	
Kansas City	963	78	95	29.04	30.06	− .01	63.8	+ 7.3	90	3	75	37	29	52	35	52	45	59	0.75	− 2.6	3	5,520	s.	29	sw.	15	20	6	5	3.1	
Springfield, Mo.	1,324	164	103	28.66	30.05	− .03	65.8	+ 7.6	90	5	76	36	29	55	32	53	45	57	0.98	− 1.9	3	6,858	se.	25	se.	14	18	10	3	2.9	
Topeka	......	81	...	......	......	......	63.0	+ 6.3	90	1	75	36	29	50	36	...	...	...	1.37	− 0.4	6	......	s.	...	......	...	18	8	5	...	
Lincoln	1,199	74	84	28.75	30.03	......	58.9	+ 4.8	91	14	71	33	29	47	42	49	44	67	2.77	+ 1.0	7	8,304	se.	38	n.	31	17	7	7	3.8	
Omaha	1,103	92	97	28.86	30.03	− .03	59.2	+ 6.4	91	14	70	35	29	48	39	50	44	65	1.82	− 0.6	7	5,780	se.	26	s.	14	15	10	6	4.4	
Sioux City	1,139	96	64	......	......	......	54.8	+ 3.1	89	1	66	30	9	43	42	...	...	...	2.02	+ 0.3	5	9,006	se.	38	sw.	14	13	7	11	5.3	
Pierre	1,460	50	61	28.44	30.00	− .03	53.1	+ 3.6	92	1	65	28	20	42	45	44	39	68	0.40	− 0.2	5	6,525	se.	48	e.	3	12	11	8	5.0	
Huron	1,306	56	67	28.62	30.03	.00	50.6	+ 4.1	90	1	63	23	9	38	41	42	37	71	2.13	+ 0.8	8	9,190	nw.	41	s.	1	13	7	11	5.3	0.7
Yankton	1,234	52	58	......	......	......	54.2	+ 4.0	89	1	66	32	*	43	41	...	...	...	1.20	− 0.2	7	6,656	n.	33	s.	25	11	9	11	5.1	
Northern Slope.							48.2	+ 2.1											1.17	+ 0.4											
Havre	2,494	15	33	27.33	29.97	− .05	46.0	+ 2.5	82	1	60	18	31	32	51	38	31	64	0.53	− 0.1	6	6,776	sw.	40	sw.	28	16	9	6	4.3	
Miles City	2,372	41	49	27.49	29.99	− .05	49.0	+ 2.9	88	1	62	22	27	36	40	40	33	62	0.44	− 0.4	8	4,858	s.	36	sw.	2	14	13	4	4.1	1.2
Helena	4,108	88	93	25.88	30.10	+ .04	46.4	+ 1.4	75	6	57	25	14	36	33	38	29	55	0.81	0.0	6	5,330	sw.	36	sw.	10	18	4	9	3.9	2.1
Rapid City	3,251	46	50	26.64	30.01	− .03	51.5	+ 2.7	87	1	64	28	18	39	40	40	28	49	0.15	− 0.5	3	6,232	nw.	30	nw.	26	10	9	12	5.4	
Cheyenne	6,105	58	60	24.05	30.08	+ .01	46.4	+ 0.4	75	4	59	20	26	33	38	36	25	51	1.03	+ 0.3	9	7,626	nw.	39	nw.	11	13	11	7	4.6	9.2
Lander	5,372	28	36	24.69	30.10	+ .02	45.1	+ 2.1	75	11	58	14	27	32	41	36	27	58	1.12	+ 0.2	7	3,280	sw.	40	sw.	22	11	10	10	5.1	10.3
North Platte	2,826	43	52	27.11	30.06	.00	53.1	+ 2.9	90	9	67	25	27	40	50	44	38	69	4.11	+ 3.1	7	7,233	nw.	51	nw.	26	12	13	6	4.6	5.0
Middle Slope.							59.0	+ 3.6											2.67	+ 1.4											
Denver	5,290	79	151	24.77	30.08	+ .02	51.0	+ 0.3	81	13	64	19	17	38	44	40	28	50	1.64	+ 0.7	6	6,264	s.	36	n.	26	9	13	9	5.0	16.4
Pueblo	4,713	74	81	25.30	30.04	+ .01	53.4	+ 1.4	85	2	69	26	29	38	48	41	29	50	1.22	+ 0.5	7	5,782	nw.	56	n.	26	11	15	5	4.9	0.5
Concordia	1,398	42	47	28.54	30.02	− .04	60.4	+ 5.6	90	14	72	33	29	49	42	50	44	68	5.80	+ 4.3	7	5,688	s.	30	s.	14	17	8	6	3.9	
Dodge City	2,504	44	52	27.43	30.03	.00	59.8	+ 4.0	90	13	73	28	29	46	46	48	12	67	2.66	+ 1.4	7	8,685	s.	39	s.	14	18	8	5	3.7	0.4
Wichita	1,351	78	85	28.61	30.03	− .01	63.6	+ 5.9	88	*	75	32	29	52	35	52	46	63	3.89	+ 2.1	5	6,015	se.	30	s.	13	18	7	6	3.2	
Oklahoma	1,218	54	53	28.76	30.04	− .02	66.0	+ 4.5	91	5	78	36	29	54	34	55	49	65	0.81	− 0.9	6	6,707	s.	28	n.	31	22	4	5	2.9	
Southern Slope.							62.8	+ 1.8											1.48	− 0.4											
Abilene	1,749	47	54	28.25	30.06	− .02	67.1	+ 1.9	89	*	78	34	28	56	35	56	51	66	1.32	− 1.0	7	6,072	se.	36	se.	25	15	12	4	3.6	
Amarillo	3,691	54	61	26.31	30.06	.00	58.4	+ 1.7	85	14	71	27	28	46	36	48	41	64	1.63	+ 0.2	7	12,242	s.	48	n.	27	16	8	7	4.1	
Southern Plateau.							62.5	− 1.3											0.72	0.0											
El Paso	3,767	10	110	26.20	30.01	.00	63.0	− 0.7	87	14	76	33	30	50	41	49	39	51	0.77	− 0.2	4	7,369	ne.	42	nw.	25	16	13	2	3.4	T.
Santa Fe	6,998	47	50	23.32	30.06	+ .02	49.0	− 0.7	71	6	58	20	28	40	27	40	32	59	1.95	+ 1.0	11	4,939	se.	33	s.	24	15	10	6	4.0	5.8
Phœnix	1,076	47	57	28.75	29.87	......	68.1	− 1.2	100	6	82	42	25	54	44	53	42	44	0.15	− 0.5	2	2,816	e.	26	e.	28	19	10	2	2.5	
Yuma	139	16	50	29.74	29.88	− .03	70.0	− 2.5	99	*	84	42	30	56	41	56	43	43	T.	− 0.3	0	......	w.	32	n.	26	29	2	0	0.9	
Middle Plateau.							48.8	− 1.0											1.64	+ 0.8											
Carson City	4,720	82	92	25.30	30.08	......	47.6	− 2.5	77	11	61	22	16	34	44	39	28	53	1.53	+ 1.1	10	4,153	ne.	47	sw.	22	15	10	6	4.0	T.
Winnemucca	4,340	59	70	25.69	30.07	.00	47.8	− 0.2	78	5	61	24	27	34	45	39	27	33	1.47	+ 1.0	8	......	n.	...	......	...	16	7	8	3.7	...
Salt Lake City	4,344	83	90	25.68	30.09	.00	50.9	− 0.3	74	12	61	29	27	41	31	44	37	62	1.91	+ 0.4	7	4,376	se.	36	sw.	24	11	5	15	5.8	3.0
Northern Plateau.							48.6	+ 0.3											0.58	− 0.8											
Baker City	3,470	49	55	26.49	30.09	+ .01	47.2	− 0.4	77	6	60	22	14	34	38	39	29	54	0.33	− 0.8	6	4,903	s.	40	s.	21	16	7	8	4.2	
Idaho Falls	4,742	10	56	25.29	30.12	+ .03	45.4	+ 1.8	75	6	58	20	27	33	39	40	36	77	1.48	+ 0.4	11	6,810	s.	44	s.	1	12	5	14	5.4	4.4
Spokane	1,943	99	107	28.02	30.09	+ .03	47.8	+ 0.5	75	6	60	26	26	36	35	42	35	66	0.27	− 1.3	5	3,017	ne.	20	s.	25	14	3	14	4.9	
Walla Walla	1,018	65	73	28.98	30.07	− .01	53.8	− 0.8	79	7	65	30	16	43	33	47	40	61	0.23	− 1.3	3	3,434	s.	28	s.	23	21	7	3	3.1	
N. Pac. Coast Reg.							52.4	0.0											2.40	− 2.7											
Fort Canby	179	10	34	29.83	30.03	.00	54.2	+ 1.0	80	5	58	43	14	50	24	51	48	83	2.49	− 2.9	13	9,272	s.	76	se.	23	11	6	14	5.8	
Port Angeles	29	47	62	......	......	......	47.8	+ 0.1	69	6	64	32	14	41	22	...	...	...	1.13	− 1.4	9	3,326	e.	30	e.	22	7	11	13	6.2	
Pysht *e*	......	5	...	......	......	......	48.4	......	63	*	54	31	13	42	20	...	...	...	2.55	− 3.8	10	......	e.	...	......	...	12	4	10	...	
Seattle	119	100	108	29.93	30.06	......	51.0	......	68	6	58	37	14	45	23	48	46	83	1.92	......	7	3,054	se.	26	s.	19	10	10	11	5.4	
Tacoma	213	...	...	......	......	......	50.0	......	65	4	57	34	14	42	27	...	...	...	1.63	......	8	3,050	n.	31	sw.	19	3	13	15	6.5	
Tatoosh Island	86	7	21	29.94	30.04	+ .01	50.5	+ 0.1	58	7	54	41	14	47	12	48	46	83	2.91	− 5.6	10	9,982	e.	55	e.	22	7	0	24	7.6	
Astoria	......	39	60	......	......	......	54.4	− 0.4	74	5	60	40	15	49	18	...	...	...	3.07	− 3.1	9	......	sw.	...	......	...	14	2	15	...	
Portland, Oreg.	153	203	213	29.89	30.05	− .03	54.2	+ 0.2	81	*	62	37	15	46	26	49	45	75	1.99	− 2.1	9	4,933	nw.	42	se.	23	12	12	7	4.4	
Roseburg	521	56	67	29.48	30.05	− .06	53.0	− 0.8	84	5	64	29	15	42	39	48	44	77	2.66	− 0.1	7	1,900	e.	24	s.	23	17	7	7	3.8	
Mid. Pac. C'st Reg.							58.3	0.0											2.36	+ 0.7											
Eureka	64	60	69	30.00	30.06	.00	53.8	+ 1.7	84	5	61	39	15	47	30	50	47	82	2.63	+ 0.1	9	3,811	nw.	33	se.	22	12	10	9	4.9	
Redbluff	334	54	58	29.65	30.00	− .01	62.9	− 0.1	91	5	74	45	24	52	33	52	41	52	2.70	+ 1.3	7	4,385	nw.	26	n.	26	21	4	6	2.8	
Sacramento	71	106	117	29.92	30.00	− .01	60.8	− 0.9	87	4	72	40	24	49	36	52	45	63	1.96	+ 1.1	4	6,227	s.	36	se.	23	17	9	5	3.4	
San Francisco	153	161	167	29.87	30.03	+ .01	58.4	− 1.4	85	4	64	48	18	53	31	53	49	77	1.70	+ 0.5	4	7,217	w.	37	w.	8	15	9	7	4.4	
Point Reyes Light	......	12	...	......	......	......	55.6	+ 0.6	79	4	60	44	*	51	27	...	...	...	2.81	+ 0.5	5	......	nw.	...	......	...	10	8	13	...	
S. Pac. Coast Reg.							61.9	− 2.7											1.57	+ 1.0											
Fresno	332	67	70	29.61	29.96	− .02	61.2	− 4.8	87	11	73	40	25	49	33	53	46	63	1.19	+ 0.7	7	2,895	nw.	24	nw.	24	23	2	6	2.8	
Los Angeles	330	74	82	29.63	29.98	.00	62.0	− 2.3	83	18	72	45	26	52	31	55	50	73	2.47	+ 1.7	3	2,929	w.	20	nw.	25	15	11	5	3.6	
San Diego	87	59	70	29.88	29.98	− .01	62.4	− 0.9	76	18	69	51	16	56	23	55	51	70	1.06	+ 0.7	3	4,445	nw.	24	nw.	14	25	4	2	2.0	
San Luis Obispo	201	10	46	29.82	30.04	......	59.2	......	89	4	72	39	29	46	45	51	47	73	0.79	......	3	3,315	n.	20	w.	1	16	10	5	3.6	

NOTE.—The data at stations having no departures are not used in computing the district averages. Letters of the alphabet denote number of days missing from the record. * Two or more dates. † Received too late to be considered in departures, etc.

TABLE II.—*Meteorological record of voluntary and other cooperating observers, October, 1897.*

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Alabama.	°	°	°	*Ins.*	*Ins.*
Alco †	89	38	68.0	0.77	
Ashville †	96	33	65.1	1.00	
Bermuda † [8]	89	40	68.0	2.10	
Brewton †	92	38	65.8	0.00	
Bridgeport †				2.07	
Citronelle †	85	53	71.4	0.72	
Clanton †	88	37	65.6	0.05	
Daphne †	90	43	69.0	5.00	
Decatur †	90	33	63.8	2.75	
Demopolis				0.15	
Elba †	87	38	66.6	0.89	
Eufaula *a* †	92	40	69.5	1.07	
Evergreen	89	41	67.2	0.15	
Florence *a* †				0.81	
Florence *b* †	91	36	66.4	2.07	
Fort Deposit †	90	43	69.3	T.	
Gadsden	92	35	65.8	0.30	
Goodwater †	97	37	66.9	0.00	
Greensboro †	92	41	68.8	1.96	
Hamilton	94	30	64.6	2.77	
Healing Springs †	92	34	66.0	0.41	
Highland Home †	89	48	70.3	1.74	
Jasper	96	31	64.4	2.43	
Livingston	93	36	67.4	0.57	
Lock No. 4	95	36	65.3	0.74	
Madison Station †	90	33	64.3	2.12	
Maple Grove				1.60	
Marion †	90	44	69.6	2.55	
Mount Willing †	91	38	67.4	0.00	
Newbern †	91	40	69.0	1.98	
Newburg	93	30	65.1	1.48	
Newton †	89	43	67.8	2.16	
Oneonta	90	34	64.4	0.88	
Opelika †	94	44	69.6	2.14	
Oxanna †	89	33	64.1	0.53	
Pineapple	91	40	68.4	0.30	
Pushmataha †	93	40	68.2	2.44	
Riverton †	92	33	65.1	1.84	
Rockmills †	91	40	66.4	1.29	
Scottsboro †	96	33	63.6	4.53	
Selma †	89	42	67.8	0.52	
Talladega * [1]	88	37	64.8	0.34	
Tallassee				0.41	
Thomasville	92	44	69.2	0.10	
Tuscaloosa †	90	43	68.2	0.41	
Tuscumbia	90	36	65.6	0.73	
Union †	95	35	68.2	1.29	
Union Springs †	88	44	68.5	1.02	
Uniontown †	92	46	71.0	1.86	
Valleyhead	89	39	64.8	4.43	
Warrior				0.94	
Wetumpka	89	39	69.6	0.20	
Wilsonville †				0.54	
Arizona.					
Arizona Canal Co. Dam	92	49	72.4	0.00	
Benson * [8]	95	48	66.0	0.00	
Bisbee †	82	33	60.6	0.52	T.
Buckeye †	102	38	66.6	0.00	
Buttes				0.24	
Calabasas	86	35	61.6	0.06	
Cedar Springs		31		0.21	T.
Congress	90	42	66.7	0.59	
Dragoon				0.05	
Dragoon Summit * [5]	82	38	67.5		
Dudleyville	95	34	65.8	0.84	
Farleys Camp †	95	40	67.4	0.37	
Flagstaff †	75	28	49.0		3.0
Fort Apache	81	27	54.2	1.30	
Fort Defiance	78	21	46.1	1.43	2.0
Fort Grant †	86	33	61.7	0.33	
Fort Huachuca †	83	32	60.8	0.62	
Gilabend *a* * [8]	101	50	62.3	0.20	
Glendale	98	38	66.0	T.	
Holbrook †	83	27	54.0	0.91	
Jerome	83	33	57.8	1.05	
Lochiel * [1]	78	36	56.7	0.59	
Maricopa * [8]	107	48	75.2	0.70	
Mesa †	98	42	67.0	0.10	
Mount Huachuca	83	30	59.0	1.06	T.
Music Mountain	96	32	61.5	0.47	
Natural Bridge				0.70	
Oracle †	85	36	61.6	0.92	
Oro				0.83	
Oro Blanco	91	34	61.7	0.09	
Pantano * [8]	85	45	63.5	0.00	
Parker	104	38	68.4	0.10	
Payson				0.58	
Peoria †	96	43	67.6	0.35	
Phœnix	96	39	64.9	0.22	
St. Helena Ranch				0.51	T.
San Carlos †	95	34	63.5	0.35	
San Simon * [8]	90	35	62.8		
Signal †	98	39	66.4	T.	
Snowflake	79	24	51.2	0.88	
Strawberry	78	22	50.1	0.65	T.
Sulphur Spring Valley				0.02	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Arizona—Cont'd.	°	°	°	*Ins.*	*Ins.*
Texas Hill * [8]	108	49	69.5	0.00	
Tombstone	82	35	61.4	0.05	
Tucson *c* †	92	29	67.6	0.54	
Whipple Barracks †	83	21	51.0	1.20	
White Hills	90	41	64.8	0.44	
Willcox * [8]	84	38	62.9	0.04	
Williams	77	23	49.4	2.65	6.0
Arkansas.					
Amity	93	36	67.6	1.77	
Arkansas City †				1.60	
Blackton				1.75	
Blanchard Springs †	93	39	68.4	5.36	
Brinkley	92	32	67.6	0.89	
Camden *a* †				4.28	
Camden *b* †	93	40	68.9	4.88	
Canton * [1]	94	34	63.6		
Conway	96	34	67.3	2.10	
Corning †	93	29	63.9	2.35	
Dallas	90	35	66.8	0.83	
Dardanelle				0.49	
Elon †	95	34	69.2	4.52	
Fayetteville †	93	31	66.0	1.30	
Forrest	94	36	67.9	0.50	
Fulton †				3.85	
Hardy	92	34	65.5	1.68	
Helena *a* †				1.20	
Helena *b*	99	38	69.6	2.02	
Hot Springs *a*	98	40	71.6	2.65	
Hot Springs *b*				1.87	
Hot Springs (near)				2.19	
Jonesboro	98	35	66.0	1.97	
Keesees Ferry †	98	28	66.9	0.52	
Lacrosse †	92	34	64.8	1.15	
Lonoke * [1]	93	34	66.1	1.50	
Luna Landing * [6]	90	38	67.4	4.07	
Lutherville * [1]	93	36	70.2		
Magnolia	95	41	72.5	2.91	
Malvern †	97	35	68.0	1.65	
Marianna * [1]	90	42	67.3		
Marvell	94	37	68.8	1.44	
Monticello				2.90	
Moore				1.06	
Mossville	90	41	69.6	0.96	
Mount Nebo †				0.44	
New Gascony * [1]	90	41	68.3	2.29	
Newport *a* †				1.03	
Newport *b* †	92	32	64.2	0.93	
Newport *c* †	95	31	65.7	1.84	
Oregon * [1]	88	38	64.2		
Ozark †	95	39	71.4	1.39	
Picayune †	95	36	70.8	2.59	
Pinebluff †	96	38	69.0	2.45	
Pocahontas †	90	32	64.4	0.81	
Powell * † [1]	94	32	63.6	0.50	
Prescott	95	39	69.0	3.91	
Rison	96	37	68.7	3.20	
Russellville	92	30	65.4	0.29	
Silver Springs †	87	30	63.0	1.85	
Spielerville	94	37	69.4	0.70	
Stamps	96	40	70.2	2.69	
Stuttgart †	93	36	67.2	1.42	
Texarkana †	97	49	74.7	3.42	
Warren †	96	37	69.4	2.55	
Washington * † [1]	94	41	71.2	2.82	
Wiggs * [1]	94	46	69.6	2.37	
Winslow	87	33	66.6	1.63	
Witts Springs † [4]	92	36	67.2		
California.					
Arlington Heights	84	42	61.5	1.57	
Athlone * [8]	88	50	66.0	1.64	
Azusa				7.85	
Ballast Point L. H				1.10	
Bear Valley				5.24	13.0
Berkeley	83	45	58.2	2.48	
Bishop †	81	27	51.6	0.39	
Boca * [8]	72	17	41.3	2.10	3.0
Bodie †	64	10	35.9	2.31	7.5
Bowmans Dam * † [1]	76	30	46.6	4.74	7.0
Caliente * [8]	80	44	61.6	0.90	
Calloway Canal * † [5]	84	46	64.4	1.23	
Campbell	84	34	57.2	1.04	
Cape Mendocino L. H				2.20	
Castle Pinckney * [1]	80	50	61.7	1.61	
Cedarville †	76	25	48.2	0.90	T.
Centerville * [1]	90	47	61.5	2.42	
Chico * [8]	85	42	61.6	3.26	
Cisco * [8]	60	28	41.1		
Claremont †	78	40	58.2	2.54	
Corning * [8]	86	43	60.8	2.18	
Craftonville	77	44	57.7	2.46	
Crescent City †	87	34	53.6	4.68	
Crescent City L. H				4.34	
Daunt				2.45	
Delano * [8]	89	44	58.5	0.88	
Delta * [8]	89	35	55.5	3.40	
Descanso * [5]	77	29	52.3	2.83	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
California—Cont'd.	°	°	°	*Ins.*	*Ins.*
Drytown	85	36	56.4	2.50	
Dunnigan * [8]	85	46	62.5	2.00	
Durham * [1]	86	41	56.2	3.54	
East Brother L. H				1.00	
Edmanton * [1]	77	29	48.2	4.38	6.0
Elsinore	88	37	63.6	1.06	
Escondido	86	31	59.2	1.52	
Fallbrook * [1]	82	44	58.8	2.82	
Fordyce Dam				5.55	25.0
Fort Bragg †				2.75	
Fort Ross	83	42	56.6	4.25	
Fort Tejon				1.39	
Georgetown	83	36	57.0	4.25	
Glendora				7.15	
Goshen * [8]	86	40	61.3		
Grand Island * [5]	92	44	63.8	1.74	
Grass Valley				3.44	
Greenville †	83	23	49.0	2.86	
Guinda				1.50	
Healdsburg * [1]	88	34	57.8	2.41	
Hollister	89	33	57.2	1.08	
Humboldt L. H				2.97	
Indio * [8]	92	36	70.7	0.00	
Iowa Hill * [1]	80	37	53.9	3.09	
Jackson	80	34	54.6	3.05	
Jolon				0.43	
Keeler * [8]	92	43	64.3	0.15	
Keene * [8]	80	40	54.6	1.01	
Kennedy Gold Mine	84	37	57.2	3.68	
Kernville				0.45	
King City * [8]	90	38	61.3	0.73	
Kingsburg * [8]	78	45	61.0	1.50	
Kono Tayee	80	43	60.7	1.24	
Lagrange * [5]	89	40	64.4	1.97	
Laporte * † [1]	70	26	45.9	6.79	19.5
Las Fuentes Ranch				1.45	
Lemoore *a* * [8]	84	38	58.8	1.35	
Lick Observatory	70	33	45.9	1.26	
Lime Kiln *c*	100	46	67.0		
Lime Point L. H				2.12	
Lodi	88	41	59.8	1.29	
Los Alomos				0.95	
Los Gatos *b*	80	42	57.6	1.84	
Lytton Springs	86	41	60.0	2.50	
McMullin * [1]	84	40	61.4		
Malakoff Mine * [1]	76	37	51.2	5.05	
Mammoth Tank * [8]	99	57	74.1	T.	
Manzana	78	29	55.8	0.21	
Mare Island L. H				2.39	
Merced * [8]	84	44	60.0	0.41	
Mills College				2.99	
Milton (near) * [1]	85	44	62.8	2.30	
Modesto * [8]	90	42	66.1	1.10	
Mohave * [8]	85	43	60.7	0.00	
Mokelumne Hill * [3]		42	55.4	2.97	
Monterey * [8]	76	43	56.9	0.70	
Napa *b*	92	38	59.0	2.43	
Needles	97	47	71.8	T.	
Nevada City	81	31	52.7	3.36	
Newhall * [8]	88	38	58.6	1.00	
North Ontario	76	44	59.3	3.41	
North San Juan * [1]	76	33	49.8	4.33	
Oakland *a*	80	43	58.2	3.27	
Ogilby * [8]	95	53	70.7	0.00	
Oleta * [1]	82	37	53.3	3.00	
Orangevale †	90	38	60.6	2.32	
Orland * [8]	90	40	63.3		
Oroville *b*	98	48	66.3	2.95	
Palermo †	95	40	61.7	3.50	
Paso Robles *b*	84	36	58.2	0.56	
Peachland * [1]	84	37	56.6	3.17	
Piedras Blancas L. H				0.90	
Pigeon Point				0.95	
Pilot Creek				4.91	T.
Pine Crest	80	47	61.7	2.00	
Placerville	83	33	53.4	3.39	
Point Ano Nuevo L. H				1.30	
Point Arena L. H				1.80	
Point Bonita L. H				3.17	
Point Conception L. H				0.63	
Point Fermin L. H				1.55	
Point George L. H				1.93	
Point Hueneme L. H				0.76	
Point Lobos	75	44	56.2	2.13	
Point Loma L. H				0.59	
Point Montara L. H				3.65	
Point Pinos L. H				0.92	
Point Reyes L. H				2.81	
Point Sur L. H				1.49	
Pomona (near)	81	40	60.9	1.26	
Poway * [8]	80	37	59.7	1.70	
Quincy †	73	27	49.8	3.01	
Ravenna * [8]	92	42	63.7	0.97	
Redding *b* †	91	40	63.0	1.36	
Represa	84	48	61.2	2.61	
Roe Island L. H				1.15	

TABLE II.—*Meteorological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
California—Cont'd.	°	°	°	*Ins.*	*Ins.*
Rosewood	91	31	57.5	1.28	
Sacramento *a*	84	40	59.4	2.03	
Salinas *[8]	75	40	59.2	1.45	
Salton *[8]	108	60	79.0	0.00	
San Bernardino †	84	38	60.3	2.10	
San Jacinto	82	36	58.1	3.38	
San Leandro *[1]	85	46	61.6	2.67	
San Luis L. H.	.....	.....	.....	0.68	
San Mateo *[8]	72	46	60.9	2.61	
San Miguel *[8]	85	39	58.2	0.27	
San Miguel Island	74	48	58.8	0.76	
Santa Ana *[5]	82	50	69.0	1.30	
Santa Barbara *a*	81	47	61.0	1.44	
Santa Barbara L. H.	.....	.....	.....	1.18	
Santa Cruz *b* †	85	35	55.6	1.49	
Santa Cruz L. H.	.....	.....	.....	1.76	
Santa Maria	86	39	60.4	0.68	
Santa Monica *[8]	75	51	65.8	1.13	
Santa Paula	79	40	57.6	1.07	
Santa Rosa *[8]	84	38	59.9	1.88	
Saticoy	.....	.....	.....	0.92	
Shasta	.....	.....	.....	2.66	
Sierra Madre	78	46	60.8	3.46	
Sneddens Ranch *[1]	70	12	40.4	0.70	
S. E. Farallone L. H.	.....	.....	.....	1.70	
Stanford University	84	39	57.6	1.70	
Stockton *a*	85	41	59.2	1.37	
Summerdale †	68	26	47.1	5.22	1.0
Susanville †	74	30	50.8	2.65	2.0
Tehama *[8]	89	46	64.4	2.48	
Templeton *[8]	76	37	54.2	1.15	
Trinidad L. H.	.....	.....	.....	2.41	
Truckee *[8]	66	26	41.6	0.55	5.5
Tulare *b*	.....	.....	....	0.70	
Tulare *c*	88	36	60.2	0.59	
Turlock †	86	50	65.8	1.18	
Ukiah †	87	30	57.4	1.87	
Upper Lake	90	32	59.3	1.67	
Upper Mattole *[1]	88	37	57.1	4.75	
Vacaville *a* *[1]	90	43	62.6	2.32	
Ventura †	81	39	57.9	1.50	
Volcano Springs *[8]	102	49	73.0	0.00	
Walnut Creek	87	42	61.8	1.86	
West Palmdale *[1]	76	39	54.1	0.98	
Westpoint	.....	.....	.....	2.10	
Wheatland †	91	40	59.5	2.23	
Williams *[8]	92	44	64.6	1.27	
Wilmington *[5]	78	55	66.5	.....	
Wire Bridge *[5]	90	39	59.5	2.43	
Yerba Buena L. H.	.....	.....	.....	1.45	
Yreka †	85	25	52.4	0.68	
Yuba City *[5]	76	50	64.0	2.23	
Colorado.					
Antlers †	77	20	49.6	1.49	
Arkins	.....	.....	.....	1.07	.....
Boulder	77	24	52.2	1.66	8.7
Boxelder	.....	.....	.....	0.84	5.0
Breckenridge †	67	−2	32.7	1.02	10.2
Canyon †	87	22	53.6	1.22	2.5
Castlerock	82	9	48.6	2.82	26.0
Cheyenne Wells	88	21	53.6	2.73	3.0
Collbran	.....	.....	.....	2.17	
Colorado Springs †	78	22	48.5	0.54	4.2
Cope	87	20	51.8	2.34	13.0
Crook *e*	88	23	53.4	.....	.....
Delta	81	19	50.4	1.75	
Dumont †	.....	.....	.....	3.32	15.0
Durango	74	22	47.6	3.89	1.5
Fleming	.....	.....	.....	1.78	15.5
Fort Collins †	82	22	48.6	0.75	4.0
Fort Morgan	85*e*	14	47.6*e*	1.98	13.2
Fox	.....	.....	.....	2.70	7.0
Garnett	70	10	41.2	1.08	.....
Gleneyrie †	71	20	47.8	1.05	6.0
Goldhill *[1]	80	18	47.7	4.07	19.6
Grand Junction †	77	30	53.3	1.82	
Greeley †	81	22	49.3	1.11	11.0
Grover	.....	.....	.....	1.02	6.0
Gulch †	71	5	42.5	1.90	8.0
Gunnison *e*	70	8	44.8	1.24	4.0
Hoehne	82	20	51.5	2.20	1.0
Holly	.....	.....	.....	2.63	T.
Holyoke (near)	.....	.....	.....	2.71	8.0
Hugo	.....	.....	.....	1.00	10.0
Hugo (near)	78	11	45.6	0.96	10.0
Husted †	85	15	48.8	1.45	13.0
Lake Moraine †	63	0	37.6	3.65	34.0
Lamar †	93	26	55.9	2.86	3.0
Laporte	.....	.....	.....	0.60	3.0
Las Animas †	88	25	55.2	2.57	3.0
Lay *h*	75	28	52.4	1.14	1.5
Leadville (near) *†[1]	65	2	36.6	1.74	15.5
Leroy †	86	22	50.4	2.61	10.0
Longs Peak	67	2	39.6	1.41	8.7
Loveland	.....	.....	.....	0.61	6.0
Meeker †	73	12	44.7	1.19	

Stations	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Colorado—Cont'd.	°	°	°	*Ins.*	*Ins.*
Millbrook †	74	1	43.2	4.78	40.0
Minneapolis †	90	25	56.3	2.23	
Montrose †	75	19	48.0	1.11	T.
Moraine †	73	7	43.7	1.16	3.2
Pagoda †	78	11	44.4	1.75	T.
Paonia †	.....	.....	.....	1.57	
Parachute †	76	21	47.2	0.57	
Rangely †	78	17	46.6	2.00	5.5
Red Cliff	.....	.....	.....	0.34	3.4
Rico	66	10	40.2	2.82	.....
Rockyford	88	24	54.2	2.64	4.0
Ruby	.....	.....	.....	4.54	26.0
Saguache †	68	17	44.0	1.41	2.0
Salida	82	7	48.2	3.55	23.5
San Luis †	78	14	46.4	2.00	3.5
Santa Clara *[1]	80	5	42.2	6.50	49.0
Seibert †	.....	.....	.....	2.43	19.0
Sherwood Ranch	64	1	37.8	.....	
Smoky Hill Mine	79	5	46.5	3.85	24.0
Springfield	.....	.....	.....	3.13	
Stamford *[1]	64	2	34.9	4.30	30.0
Steamboat Springs	80	8	46.2	0.10	1.0
Surface Creek †	78	13	49.1	1.79	T.
T. S. Ranch †	77	23	49.8	1.88	
Twin Lakes	.....	.....	.....	1.62	13.0
Vilas	.....	.....	.....	2.42	0.3
Walden	70	5	39.7	0.81	1.8
Wallet †	.....	.....	.....	2.27	3.0
Wray †	88	22	52.0	2.92	7.0
Yuma	.....	.....	.....	2.55	18.0
Connecticut.					
Bridgeport	86	29	54.2	2.11	
Canton †	86	21	51.7	1.14	
Colchester	86	25	53.0	1.37	
Middletown	90	25	54.2	1.15	
New London †	82	30	53.0	1.20	
Norwalk	86	25	51.8	1.79	
Southington *[1]	85	22	51.2	0.85	
Storrs	86	25	51.2	0.92	
Voluntown †	85	21	51.2	0.80	
Waterbury	85	26	53.8	1.08	
West Cornwall †	80	29	50.6	1.04	
Windsor	83	25	51.1	0.54	
Delaware.					
Milford	90	36	60.9	5.73	
Millsboro	87	33	59.1	8.17	
Newark	86	30	55.6	2.90	
Seaford	87	34	58.8	6.81	
District of Columbia.					
Distributing Reservoir *[5]	85	39	58.6	3.19	
Receiving Reservoir *[5]	85	37	58.1	2.94	
West Washington	89	30	56.4	3.45	
Florida.					
Amelia †	84	50	70.2	7.64	
Archer †	90	45	71.6	4.29	
Bartow	92	48	73.6	2.66	
Boca Raton †	88	59	75.2	10.01	
Brooksville †	86	53	71.8	4.62	
Carrabelle †	86	52	71.6	1.10	
Clermont †	93	55	74.8	5.40	
De Funiak Springs	90	44	70.0	2.25	
Estero *[1]	85	59	73.6	.....	
Eustis †	91	54	73.3	5.43	
Federal Point †	88	51	71.2	7.28	
Fort Meade †	91	.....	.....	2.48	
Frostproof	90	53	75.2	2.34	
Gainesville	87	51	70.8	4.31	
Grasmere †	88	52	72.4	4.20	
Haywood	88	46	70.2	0.71	
Huntington	89	54	72.7	4.42	
Kissimmee	93	54	75.6	3.00	
Lake Butler	95	45	73.8	4.02	
Lake City †	89	53	72.5	3.84	
Lemon City	87	58	74.3	7.35	
Macclenny †	91	44	72.1	5.26	
Manatee *j*	87	52	72.0	.....	
Milton *[1]	88	46	68.7	3.96	
Mullet Key †	84	64	74.3	4.01	
Myers †	87	57	74.5	2.07	
New Smyrna	86	53	72.8	4.20	
Oakhill *[1]	88	61	75.9	.....	
Ocala †	90	50	72.8	3.55	
Orange City	90	49	72.7	5.26	
Orange Park	85	50	70.4	.....	
Orlando †	89	52	70.8	3.55	
Oxford *†[1]	90	55	71.8	4.10	
Perry	91	42	70.0	1.92	
Plant City	88	50	72.8	3.97	
St. Francis †	90	49	72.5	4.77	
St. Francis Barracks	85	50	71.4	7.50	
Sebastian	89	54	74.9	10.26	
Switzerland	85*i*	58*h*	69.1*i*	6.07	
Tallahassee †	87	50	69.9	2.57	
Tarpon Springs †	89	51	72.6	2.54	
Wausau	90	40	73.3	0.25	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Georgia.	°	°	°	*Ins.*	*Ins.*
Adairsville †[3]	86	38	64.8	1.92	
Alapaha	89	44	68.5	1.96	
Albany †	88	43	68.6	2.39	
Allentown †	90	41	67.5	2.51	
Americus †	89	44	68.0	1.52	
Athens †	89	41	64.1	3.12	
Bainbridge †	85	42	65.0	1.27	
Belleville	91	47	70.0	3.85	
Blakely †	87	46	69.9	1.51	
Brunswick	89	51	76.0	1.60	
Camak †	87	43	65.8	1.22	
Canton †	.....	.....	.....	3.04	
Cartersville *c*	88	38	62.6	1.07	
Cedartown	86	.....	.....	1.02	
Clayton †	86	36	61.3	3.8[illegible]	
Columbus	90	44	69.3	1.23	
Covington	83	39	60.8	2.98	
Crescent	98	53	73.0	5.50	
Dahlonega †	89	38	63.0	3.69	
Diamond	86	35	61.3	4.01	
Eastman †	89	46	66.8	2.08	
Elberton †	89	46	66.0	2.80	
Fleming †	85	44	67.8	8.60	
Fort Gaines	86	44	67.6	0.89	
Franklin	89	42	66.8	1.12	
Gainesville	86	39	62.8	2.67	
Gillsville †	91	39	65.7	5.11	
Greenbush	89	35	62.6	3.12	
Griffin †	86	43	64.8	1.18	
Hawkinsville	90	36	64.0	3.16	
Hephzibah *†[6]	88	54	70.0	1.30	
Jesup	86	49	68.6	5.43	
Lagrange †	91	43	66.2	1.70	
Louisville	90	45	68.4	0.38	
Lumpkin	88	48	70.8	2.27	
Macon † *b*	92	39	65.8	0.70	
Marietta	87	42	63.7	2.33	
Marshallville †	88	47	68.8	1.02	
Millen	91	42	67.5	1.63	
Morgan †	89	39	68.0	1.44	
Newnan †	88	44	65.8	1.08	
Piscola	87*e*	48*e*	70.6*e*	0.90	
Point Peter	86	39	62.7	2.21	
Poulan †	91	39	67.8	1.45	
Quitman †	89	42	68.4	1.24	
Ramsey	91	34	64.9	2.32	
Rome †	88	38	63.7	1.15	
Talbotton †	87	44	67.6	1.11	
Tallapoosa	88	36	64.5	1.59	
Thomasville †	90	46	70.4	0.68	
Toccoa †	85	38	60.8	3.44	
Union Point	85	41	63.6	2.27	
Washington †	96	43	68.4	4.08	
Waycross † *h*	88	47	69.7	2.63	
Waynesboro †	86	47	66.4	2.42	
Westpoint †	88	41	63.0	1.23	
Whitesburg †	.....	.....	.....	0.40	
Idaho.					
American Falls	74	23	46.2	3.09	
Blackfoot †	73	18	45.6	1.79	0.5
Boise Barracks †	80	25	49.9	1.76	
Burnside †	75	21	43.8	2.45	0.3
Cœur d'Alene	76	26	48.0	.....	
Corral *[1]	72	17	43.2	1.18	.....
Downey	75	18	41.1	2.47	6.5
Fort Sherman †	77	25	47.4	0.79	
Gimlet †	76	22	47.5	1.71	1.5
Idaho City † *k*	82	22	49.3	0.71	
Kootenai †	78	24	47.2	6.90	
Lake	64	12	41.4	1.15	11.5
Lakeview	65	31	46.0	1.17	
Lost River †	.....	.....	.....	1.86	.....
Marysville	71	15	42.1	2.34	6.0
Minidoka	92	18	47.7	2.60	.....
Murray †	72	24	43.7	1.28	.....
Nampa	84	21	50.2	1.11	
Ola †	82	19	48.9	0.94	
Paris	73	15	44.5	1.43	
Payette †	90	18	52.6	0.65	
Pollock †	77	26	51.1	0.38	
Rexburg	76	16	45.6	3.63	
St. Maries	76	26	47.5	1.22	
Salubria	83	15	48.1	0.82	
Soldier †	76	10	43.4	1.02	
Swan Valley †	74	41	42.0	2.80	8.2
Warren †	76	14	45.1	0.14	
Illinois.					
Albion †	92	37	64.0	0.63	
Alexander †	98	33	63.4	0.33	
Ashton *†[1]	92	30	56.6	0.32	
Atwood *a* *†[2]	92	28	53.3	0.24	
Atwood *b*	.....	.....	.....	0.15	
Aurora *a*	93	29	57.7	0.21	
Aurora *b*	92	30	57.0	0.33	
Bloomington †	93	29	61.0	0.48	
Bushnell †	97	30	63.0	0.21	

TABLE II.—*Meteorological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Illinois—Cont'd.	°	°	°	Ins.	Ins.
Cambridge	85	30	58.2	0.33	
Carlinville†	94	30	64.4	0.21	
Carlyle	......	......	......	0.64	
Carrollton	85	33	61.6	0.31	
Charleston	90	32	62.3	0.42	
Chemung	89	28	56.0	0.84	
Chester	......	......	......	0.17	
Cisne†	94	35	64.2	0.66	
Clearcreek†	92	25	58.3	0.18	
Coatsburg	88	31	60.2	0.53	
Cobden†	95	35	65.4	0.77	
Danville	92	......	......	0.49	
Decatur†	94	29	61.8	0.28	
Dixon†	95	30	57.7	0.48	
Dwight†	89	28	57.8	0.44	
East Peoria†	90	25	58.6	0.09	
Effingham†	92	33	62.2	0.42	T.
Evanston *[10]	86	34	58.8	......	
Fort Sheridan†	87	33	55.4	0.25	
Friendgrove *†[4]	......	40	62.5	0.53	
Galva†	93	29	58.6	0.23	
Glenwood *†[1]	94[e]	34[e]	57.6[e]	0.45	
Golconda†	92	31	64.2	1.29	
Grafton†	......	......	......	0.07	
Grayville	92	39	65.8	0.73	
Greenville†	91	33	63.3	0.59	
Griggsville†	94	34	64.0	0.25	
Halliday *[5]	92[d]	31[d]	63.2[d]	1.64	
Havana†	90	36	62.2	0.08	
Herrin	95	30	63.4	1.15	
Hillsboro†	94	34	64.1	0.25	
Iron	97	34	63.2	1.07	
Joliet†	96	30	60.5	0.44	
Jordans Grove†	94	33	63.7	1.13	
Kankakee *a*†	85	35	57.8	1.60	
Kishwaukee	89	25	55.2	0.36	
Knoxville *a*	92	32	59.9	0.20	
Lagrange†	87	31	56.0	0.33	
Laharpe *[1]	98	30	59.6	0.26	
Lanark *†[1]	90	22	55.9	0.39	
Lexington[d]	91	29	59.2	0.32	
Loami†	......	......	......	0.24	
Louisville†	92	31	63.0	0.37	
McLeansboro†	93	30	63.6	0.45	
Martinsville†	93	30	61.8	0.69	
Martinton†	95	30	59.2	0.61	
Mascoutah *[5]	90	32	62.0	0.40	
Mattoon *[1]	88	30	58.4	0.30	
Minonk†	92	27	59.0	0.13	
Monmouth†	93	30	59.1	0.13	
Morrisonville†	89	29	61.0	0.12	
Mount Carmel†	......	......	......	0.58	
Mount Pulaski	93	30	62.5	0.37	
Mount Vernon	94	......	......	0.56	
New Burnside†	94	33	64.0	1.20	
Olney *a*	93	31	62.5	0.52	
Oswego *[1]	87	25	54.2	0.15	
Ottawa†	90	28	58.3	0.46	
Palestine†	93	34	62.3	1.09	
Peoria *a*†	......	......	......	0.04	
Peoria *b*†	90	31	60.2	0.04	
Philo†	93	26	58.6	0.54	
Plumhill†	93	37	64.9	0.35	
Rantoul†	92	29	61.7	0.58	
Reynolds	91	29	58.8	0.45	
Riley†	88	27	56.0	0.48	
Robinson†	95	33	63.0	0.53	
Rockford	87	30	57.0	0.68	
Roundgrove†	89	36	58.2	0.43	
St. Charles *†[1]	87	30	55.2	0.28	
St. John *†[1]	94	37	64.8	1.46	
Scales Mound	88	20	55.2	0.50	
Streator†	92	30	58.8	0.23	
Sycamore†	93	26	56.0	0.38	
Tiskilwa *†[3]	86	30	54.6	0.36	
Tuscola†	93	28	60.6	0.27	
Walnut†	98	26	61.4	0.25	
Wheaton *[8]	......	36	53.0	0.49	
Winchester *[1]	90	32	59.3	0.38	
Winnebago†	89	26	56.4	0.58	
Zion†	88	25	54.4	0.85	
Indiana.					
Anderson†	89	33	59.8	0.39	
Angola *[1]	90	31	57.7	2.10	
Auburn	89[d]	28[d]	55.4[d]	0.57	
Bloomington†	87	37	61.5	1.33	
Bluffton†	94	33	57.2	0.64	
Bright†	87	35	61.3	1.40	
Butlerville†	89	31	60.2	1.23	
Cambridge City†	90	21	56.8	0.39	
Columbia City *[1]	84	34	56.2	1.06	
Columbus†	91	29	59.3	0.90	
Connersville†	86	29	57.4	0.85	
Crawfordsville	......	......	......	1.04	
Delphi†	91	31	57.5	1.79	
Edwardsville *†[1]	86	42	66.4	2.26	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum	Mean.	Rain and melted snow.	Total depth of snow.
Indiana—Cont'd.	°	°	°	Ins.	Ins.
Evansville†	93	33	63.0	2.05	
Farmland†	85	33	57.8	0.76	
Fort Wayne	88	30	56.9	0.93	
Franklin *[1]	88	37	58.7	1.27	
Greencastle†	87	37	60.4	1.09	
Greensburg	86	32	61.9	0.44	
Hammond†	89	30	58.0	0.23	
Huntington	88	35	57.5	1.21	
Jasper†	93	32	62.3	2.10	
Jeffersonville	90	39	62.4	1.26	
Knightstown†	87	29	58.4	0.40	
Knox	84	34	58.2	0.80	
Kokomo†	88	36	59.1	1.32	
Lafayette†	92	33	60.3	1.52	
Laporte	87	26	54.5	1.08	
Logansport *b*†	86	34	55.1	2.44	
Madison†	90	32	61.8	0.99	
Marengo†	91	32	60.2	3.68	
Marion†	91	31	58.9	0.90	
Markle	86	......	......	1.00	
Mauzy†	86	31	58.1	0.98	
Michigan City *[10]	84	35	57.2	......	
Mount Vernon†	94	38	66.1	1.56	
Northfield†	89	27	58.5	0.80	
Princeton *[1]	90	35	60.6	0.85	
Richmond	89	24	58.2	0.98	
Rockport	88	41	64.0	2.33	
Rockville†	92	32	61.1	0.74	
Salem	......	......	......	3.60	
Scottsburg	89	36	60.6	2.00	
Shelbyville	87	35	60.6	1.49	
South Bend†	90	35	58.3	0.71	
Syracuse†	......	......	......	2.81	
Terre Haute†	89	38	63.1	0.54	
Tipton	89	30	58.8	0.51	
Topeka†	89	35	55.9	1.62	
Valparaiso†	92	34	57.5	1.00	
Vevay	91	32	64.5	0.85	
Vincennes†	92	36	64.4	0.44	
Warsaw†	87	35	58.1	1.07	
Washington†	91[f]	35[f]	63.2[f]	1.18	
Winamac	90	30	57.3	0.39	
Worthington†	90	32	61.4	0.96	
Indian Territory.					
Healdton†	87	35	64.9	2.52	
Kemp	......	......	......	3.50	
Lehigh†	98	33	67.7	1.93	
Purcell†	92	30	66.6	2.11	
South McAlester†	......	......	......	0.99	
Tahlequah	95	28	65.4	1.00	
Tulsa†	......	......	......	1.22	
Wagoner	99	31	66.4	1.29	
Iowa.					
Adair	......	......	......	2.90	
Afton	88	28	58.6	1.12	
Algona *[1]	86	28	54.5	0.97	
Alta *a*†	88	28	54.8	1.76	
Amana†	87	26	55.8	0.83	
Ames *b*	88	26	56.4	1.63	
Ames (near)	......	......	......	1.53	
Atlantic†	90	22	55.2	2.11	
Audubon	88	25	54.0	1.51	
Belknap	93	31	60.2	0.63	
Belleplaine	88	22	53.6	0.78	
Bonaparte†	96	27	60.6	0.24	
Britt	90	22	53.5	0.96	
Burlington	93	32	64.6	0.38	
Carroll	91	28	56.0	0.97	
Cedar Falls	89	25	56.2	0.93	
Cedar Rapids†	90	30	58.5	1.01	
Chariton	89	32	59.6	0.88	
Charles City	87	22	54.8	0.32	
Clarinda†	85	34	59.4	1.62	
Clinton	87	28	56.9	0.37	
College Springs	91	30	60.4	1.63	
Corning†	92	28	59.9	1.29	
Council Bluffs	92	32	58.2	2.53	
Cresco†	87	23	54.1	0.31	
Decorah†	87	22	55.2	0.43	
Delaware *[3]	92	28	52.2	1.00	
Denison†	87	28	58.2	0.95	
Dows	90	23	55.8	0.52	
Eldora	95	23	56.4	1.06	
Elkader†	93	23	56.4	0.92	
Estherville	91	22	53.1	1.45	
Fairfield†	94	25	59.0	0.19	
Fayette†	90	21	55.4	1.03	
Fonda	92	30	56.6	0.58	
Forest City	90	23	54.0	1.19	
Fort Madison *†[1]	86	36	61.5	0.26	
Galva†	91	26[e]	57.1	1.63	
Gardengrove	90	24	56.3	0.46	
Gladbrook	......	......	......	1.45	
Glenwood†	90	31	59.7	2.58	
Grand Meadow *[1]	84	30	54.4	1.10	
Greene	90	24	56.2	0.40	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Iowa—Cont'd.	°	°	°	Ins.	Ins.
Greenfield	92	32	57.6	1.61	
Grinnell	78	31	54.6	0.42	
Grundy Center	89	25	55.7	1.36	
Hampton	88	26	55.4	0.70	
Hawkeye	......	......	......	0.60	
Hedrick *[1]	89	37[e]	58.9[e]	0.77	
Hopeville†	89	32	59.0	0.73	
Humboldt†	91	24	56.3	0.73	
Independence†	89	23	53.6	0.40	
Indianola†	90	29	59.1	0.64	
Iowa City *a*	91	26	58.4	0.33	
Iowa City *b*	87	27	56.1	......	
Iowa Falls†	89	23	55.2	1.39	
Keosauqua	91	30	60.0	0.11	
Knoxville	89	32	58.6	0.51	
Lamoni	91	27	59.1	0.69	
Lansing	90	25	57.0	0.26	
Larchwood	......	......	......	1.77	
Larrabee†	89	26	54.4	2.31	
Leclaire	......	......	......	0.33	
Lemars	88	28	54.6	1.95	
Lenox *[1]	89	32	58.3	1.17	
Logan†	90	29	57.2	1.04	
Malvern *[1]	97	24	56.6	3.17	
Maple Valley	......	......	......	1.64	
Maquoketa	87	25	55.9	0.29	
Marshall†	93	25	58.4	2.57	
Mason City	88	12	51.6	0.37	
Millman	......	......	......	1.03	
Monticello	86	24	56.6	1.12	
Mooar	94	29	58.8	0.26	
Mountayr†	93	27	59.0	1.06	
Mount Pleasant *[1]	89	36	60.0	0.22	
Mount Vernon *a* *[1]	91	32	58.7	0.56	
Mount Vernon *b*	87	28	55.8	0.42	
New Hampton [j]	85	25	57.8	......	
Newton†	89	28	56.8	0.58	
North McGregor	......	......	......	0.03	
Northwood	89	26	53.0	0.91	
Odebolt	......	......	......	1.25	
Ogden	91	27	57.4	1.32	
Osage†	......	......	......	0.44	
Osceola	91	33	59.2	0.60	
Oskaloosa†	92	24	58.0	0.39	
Ottumwa	97	31	59.6	0.78	
Ovid†	95	28	60.4	0.70	
Plover	94	20	54.8	1.02	
Portsmouth	......	......	......	2.01	
Primghar	90	27	54.8	2.30	
Red Oak	90	28	58.6	3.09	
Rock Rapids	91	22	52.8	1.06	
Rockwell City	91	23	52.4	0.81	
Sac City†	91	29	52.6	1.60	
St. Charles [g]	91	33	60.6	0.92	
Seymour†	95	29	60.8	0.07	
Sibley	92	24	52.9	1.39	
Sidney	90	31	58.8	3.15	
Sigourney	92	32	59.6	0.64	
Spencer	91	23	53.0	1.95	
Spirit Lake†	95	26	54.6	1.72	
Thurman	90	28	58.6	3.30	
Toledo	90	24	56.0	0.56	
Villisca†	88	27	56.8	1.64	
Vinton *[1]	89	26	56.8	0.62	
Washington	92	26	58.0	0.12	
Washta	......	......	......	1.87	
Waterloo	91	26	55.9	0.93	
Waukee	89	26	57.2	1.10	
Waverly	88	27	56.8	1.25	
Webster City	86	27	55.7	0.58	
Westbend *†[1]	91	29	52.4	1.10	
West Branch	88	23	55.5	0.34	
Whitten *[1] [e]	89	32	56.3	1.31	
Wilton Junction†	88	24	56.4	0.28	
Winterset†	92	27	57.8	1.03	
Kansas.					
Abilene†	92	31	61.7	2.28	
Achilles	......	......	......	5.29	
Altoona *†[3]	90	34	58.8	0.77	
Anthony	......	......	......	1.75	
Assaria	92	30	60.6	1.85	
Atchison†	97	31	63.4	0.84	
Augusta	90	31	63.2	2.24	
Beloit†	91	31	60.6	5.52	
Burlington†	91	31	63.6	0.84	
Campbell	92	30	60.8	4.35	
Colby†	89	24	53.7	5.50	1.0
Columbus	98	30	65.0	1.26	
Coolidge†	90	24	55.3	2.32	T.
Cunningham†	91	27	60.6	1.42	
Dresden *[1]	90	29	54.6	4.84	T.
Ellinwood†	90	29	59.8	2.44	
Emporia†	85	35	62.0	1.80	
Englewood†	94	27	60.8	1.73	
Eskridge	90	36	61.9	1.34	
Eureka†	......	......	......	2.67	

TABLE II.—*Meteorological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Kansas—Cont'd.	°	°	°	*Ins.*	*Ins.*
Eureka Ranch†	93	27	58.2	2.57	
Fall River	90	33	64.3	1.47	
Fort Riley†	91	30	63.4	2.12	
Fort Scott†	93	33	65.4	0.54	
Frankfort	96	29	60.8	2.61	
Garden City†	89	27	57.2	1.78	2.0
Garfield	......	......	......	2.80	
Gibson	97	25	58.0	2.25	T.
Gove*†[1]	90	29	59.0	2.67	T.
Grainfield*[6]	92	29	58.6	1.50	
Grenola	93	32	63.0	1.42	
Halstead	84	28	58.1	1.46	
Horton	91	33	61.6	1.52	
Hoxie	88	25	55.2	3.55	
Independence†	95	33	66.2	0.99	
Lakin†	92	22	61.0	2.15	0.5
Lawrence	89	34	62.4	1.08	
Lebo†	90	33	62.7	1.26	
McPherson	......	29	......	1.99	
Manhattan *b*	93	32	62.2	2.02	
Manhattan *c*	93	29	62.0	2.04	
Marion†	88	31	63.8	2.20	
Meade†	96	30	65.5	1.92	T.
Medicine Lodge†	91	29	61.2	3.44	
Minneapolis†	91	29	60.4	3.07	
Morantown†	89	32	64.4	0.81	
Mounthope*[1]	87	32	61.2	1.02	
Ness City	90[f]	32[g]	64.6[g]	2.53	
Newton	92	30	64.0	1.44	
Norton	......	......	......	3.92	
Norwich†	91[d]	33[d]	62.2[d]	1.15	
Oberlin†	......	......	......	5.07	1.0
Olathe†	90	30	63.7	0.55	
Osage City†	91	30	63.4	1.20	
Oswego	97	32	68.7	1.71	
Ottawa	89	30	61.8	0.59	
Phillipsburg	94	26	58.2	5.18	
Pleasant Dale	91	28	60.6	3.16	
Pratt	89	29	56.1	0.70	
Rome*†[1]	91	33	63.0	1.21	
Russell	91	......	......	3.26	
Salina†	93	28	60.6	2.29	
Scott City	92	......	......	3.35	
Sedan†	93	31	64.5	1.97	
Seneca	91	30	60.8	1.55	
Sharon Springs*[1]	100	24	58.2	3.00	
Toronto	94	29	63.6	1.15	
Ulysses†	92[d]	22[d]	56.6[d]	1.39	0.4
Viroqua†	91	28	58.2	1.75	T.
Wallace*[1]	90	28	54.6	4.43	T.
Wamego*[1]	92	32	60.2	1.99	
Wellington*[1]	89	38	65.9	1.28	
Winona*[1]	96	32	59.8	4.50	T.
Yates Center	90	30	63.2	1.16	
Kentucky.					
Alpha	......	......	......	0.85	
Ashland	90	30	60.6	0.40	
Bardstown†	92	31	63.8	0.72	
Blandville†	89	34	64.0	1.38	
Bowling Green *a**[1]	90	27	60.5	0.89	
Bowling Green *b*†	90	35	65.6	0.80	
Burnside†	......	......	......	0.65	
Caddo	91	35	62.4	0.14	
Canton*†[1]	94	32	65.1	0.90	
Carrollton†	88	33	62.0	0.83	
Catlettsburg†	......	......	......	0.23	
Earlington*[1]	89	40	63.6	2.29	
Edmonton†	86	29	62.2	0.82	
Ensor	91	36	64.2	4.26	
Eubank[e]	89	35	62.3	0.32	
Falmouth†	......	......	......	0.42	
Frankfort†	87	31	61.0	2.18	
Georgetown	87	33	62.3	......	
Greensburg†	96	26	62.8	0.78	
Henderson†	90	40	64.8	2.18	
Hopkinsville†	91	34	65.2	1.44	
Irvington	90	38	63.8	2.46	
Leitchfield†	89	31	61.8	1.38	
Loretto	92	28	62.2	0.34	
Lyndon	89	34	62.0	2.79	
Marrowbone†	89	26	61.0	0.70	
Middlesboro†	90	29	60.0	0.91	
Mount Herman	88[k]	38	......	0.82	
Mount Sterling†	86	33	61.2	0.16	
Owensboro†	90	36	62.9	2.34	
Owenton†	88	36	62.8	0.73	
Paducah *a*†	......	......	......	0.59	
Paducah *b*†	95	37	66.9	1.82	
Pleasure Ridge Park†	92	32	61.8	2.96	
Princeton	94	30	63.8	1.64	
Richmond†	92	35	65.4	0.46	
Russellville†	96	31	66.6	2.31	
St. John†	90	30	62.4	1.65	
Sandyhook	......	......	......	0.26	
Scott	90	39	62.9	0.63	
Sergent	......	......	......	0.07	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Kentucky—Cont'd.	°	°	°	*Ins.*	*Ins.*
Shelby City	96	29	64.8	0.18	
Shelbyville†	94	33	63.0	1.19	
Southfork[2]	......	......	54.4	0.91	
Vanceburg	86	31	59.4	0.40	
Williamsburg†	......	31	......	1.30	
Louisiana.					
Abbeville	92	52	72.8	6.20	
Alexandria†	95	44	70.4	2.00	
Amite†	93	44	71.5	0.95	
Bastrop†	95	41	71.4	3.70	
Baton Rouge†	90	51	71.8	5.86	
Calhoun	92	41	69.4	2.49	
Cheneyville†	96	42	69.8	0.96	
Clinton†	90	46	70.6	2.90	
Como	93[c]	38[c]	66.8[c]	1.64	
Covington	92	44	70.6	1.35	
Donaldsonville†	94	53	72.8	1.90	
Emilie†	88	50	70.2	2.09	
Farmerville	94	42	69.4	4.27	
Franklin†	90	52	71.4	2.71	
Grand Coteau	89	52	70.9	3.72	
Hammond	91	45	66.6	3.46	
Houma	92	50	72.4	2.75	
Jeanerette	91	50	71.8	6.69	
Jennings	93	46	70.7	2.99	
Lafayette†	94	48	71.2	5.88	
Lake Charles†	90	51	73.4	4.82	
Lake Providence	95	43	71.0	3.30	
Lawrence	87	52	72.8	5.04	
Liberty Hill	98	41	71.4	5.93	
Mansfield†	95	40	68.8	6.00	
Melville	96	48	71.8	......	
Minden	96	43	71.2	5.25	
Monroe†	97	41	71.8	2.02	
Montgomery	97	46	70.2	5.94	
New Iberia	85[i]	53[i]	70.6[i]	5.75	
Oakridge†	97	39	68.9	3.40	
Oberlin	89	49	69.6	2.50	
Opelousas	95	48	72.2	3.19	
Oxford†	93	41	68.6	4.74	
Paincourtville†	87	49	69.8	2.95	
Plain Dealing†	92	42	71.0	2.78	
Plaquemine	89	52	71.6	1.54	
Rayne	94	50	72.6	5.88	
Robeline	95	38	67.4	2.59	
Ruston	94	45	71.9	4.08	
Schriever	92	48	71.8	2.48	
Southern University†	89	50	70.8	2.75	
Sugar Ex. Station†	88	52	70.8	3.93	
Sugartown†	92	51	72.9	5.14	
Venice†	86	50	71.7	3.23	
Wallace	88	52	71.5	2.42	
Whitehall	93	45	71.8	3.15	
White Sulphur Springs	97	42	71.0	2.18	
Maine.					
Bar Harbor	83	21	50.0	0.35	
Belfast*[6]	78	31	48.8	0.90	
Cornish*[1]	78	22	47.8	0.77	
Fairfield	78	20	47.6	0.53	
Flagstaff	80	13	44.6	0.72	
Fort Fairfield	75	18	44.3	1.80	T.
Gardiner	81	22	49.4	0.92	
Kineo†	73[e]	22[e]	50.6[e]	1.52	
Lewiston	84	24	50.3	0.95	
Mayfield	80	20	46.5	1.43	T.
North Bridgton	78	24	47.8	1.14	
Orono	79	19	47.2	1.01	
Maryland.					
Annapolis	82	45	60.9	3.69	
Bachmans Valley	84	30	54.4	2.22	
Boettcherville[2]	......	......	50.4	0.70	
Charlotte Hall†	88	36	59.0	6.21	
Cherryfields†[2]	......	......	59.9	5.53	
Chestertown†	81	36	57.2	3.39	
Collegepark	......	......	......	4.00	
Cumberland *b*	87	36	59.8	0.81	
Darlington†	85	30	54.8	2.85	
Deerpark	80	21	49.6	1.37	
Easton†	86	34	57.3	5.32	
Ellicott City	......	......	......	2.59	
Fallston*[1]	84	35	56.0	3.36	
Flintstone	88	22	53.6	0.88	
Frederick	86	32	55.8	1.42	
Grantsville	85	26	53.7	0.55	
Greatfalls	86	31	56.4	2.16	
Greenspring Furnace	89	30	56.0	0.97	
Hagerstown†	88	34	57.4	0.98	
Jewell†	......	......	......	5.79	
Johns Hopkins Hospital	90	40	58.1	4.21	
Laurel	90	32	58.2	4.54	
McDonogh	81	37	58.1	......	
Mardela Springs†	88	32	59.0	7.73	
Mount St. Marys Coll.†	88	32	57.0	2.24	
New Market	85	32	56.5	2.21	
Pocomoke City	91	38	62.8	3.65	
Port Deposit	85	35	56.8	2.63	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Maryland—Cont'd.	°	°	°	*Ins.*	*Ins.*
Princess Anne	84	32	58.1	5.92	
Sharpsburg	88	32	55.2	1.29	
Smithsburg	80	33	55.8	1.27	
Solomons†	89	40	61.1	5.42	
Sunnyside	82	20	51.9	1.06	
Taneytown†	91	31	56.5	1.70	
Van Bibber	87	34	55.4	3.85	
Western Port	88	28	56.1	1.20	
Westminster	90	36	59.8	3.28	
Woodstock	85	32	55.5	2.35	
Massachusetts.					
Amherst	85	22	50.3	0.76	
Bluehill (summit)	86	28	52.2	0.63	
Cambridge *a*	88	25	53.0	0.40	
Chestnut Hill	87	24	53.3	0.53	
Concord†	88	19	50.1	0.35	
Fallriver	83	32	54.2	1.10	
Fitchburg	85	23	50.8	0.91	
Framingham	87	21	51.8	0.41	
Groton	85	20	49.2	1.08	
Hadley	87	17	48.8	0.76	
Hyannis*†[1]	81	31	53.2	1.74	
Lawrence	86	26	52.8	0.30	
Lowell *a*	84	24	51.5	0.59	
Middleboro	86	20	50.8	0.94	
Monson	85	22	51.0	1.07	
New Bedford *a*	83	30	54.2	1.42	
Springfield Armory	84	23	49.8	1.64	
Taunton *b*	85	27	50.6	1.18	
Wakefield	86	25	52.2	0.36	
Westboro†	87	18	52.3	0.62	
Worcester *b*	84	27	52.2	1.05	
Michigan.					
Adrian	90	30	54.8	0.96	
Allegan	......	......	......	0.23	
Alma	86	27	52.4	2.88	
Ann Arbor	91	33	54.5	1.68	
Arbela	86	29	53.4	2.48	
Baldwin	84	22	50.4	2.28	T.
Ball Mountain	84	34	53.8	1.66	
Baraga	79	22	48.7	2.81	1.5
Battlecreek	90	32	55.2	2.15	
Bay City *b*	78	31	49.4	3.24	
Benton Harbor	85	35	56.7	1.81	
Benzonia	84	33	52.6	3.50	T.
Berlin	86	23	51.5	2.17	
Berrien Springs	91	32	56.4	2.14	
Big Rapids	82	27	51.1	1.99	
Birmingham	86	31	53.3	1.47	
Boon	80[e]	26	49.0[e]	3.38	0.2
Calumet	74	29	47.9	2.77	1.0
Camden	89	32	54.5	1.66	
Carsonville	85	19	51.7	2.56	
Charlevoix	83	34	52.6	3.75	
Cheboygan	84	31	49.6	3.63	T.
Clinton	92	30	55.4	1.88	
Coldwater	89	29	54.8	1.84	
Crisps*[10]	71	27	49.0	......	
East Tawas	82	28	50.1	4.69	
Eloise	88	31	54.7	1.04	
Escanaba†	70	28	49.6	3.76	T.
Ewen	90	22	48.1	......	2.5
Fairview	84	36	55.2	1.01	
Fitchburg	84	27	52.0	1.43	
Flint	86	25	52.4	1.46	
Frankfort*[10]	70[e]	40[d]	54.2[e]	......	
Gladwin	83	28	49.2	1.70	
Grand Point au Sable*[10]	68	38	52.4	......	
Grand Rapids *b*	89	34	53.8	1.97	
Grape	92	34	57.0	0.80	
Grayling	87	25	50.9	2.57	T.
Grindstone City*[10]	78	30	50.4	......	
Hammonds Bay*[10]	78	30	49.2	......	
Hanover	89	32	54.8	1.44	
Harrison	82	29	49.2	3.29	
Harrisville	87	30	51.5	4.03	
Hart	87	31	53.4	......	
Hastings	90	29	53.5	1.90	
Hayes	85	30	52.8	2.72	
Highland Station	......	......	......	0.77	
Hillsdale	87	31	54.4	2.39	
Holland*[10]	75	37	56.8	......	
Howell	89	30	55.5	1.38	
Humboldt	79	16	43.7	2.97	T.
Ionia	89[e]	29	53.6[e]	2.09	
Iron River	79	18	45.8	4.45	3.5
Ivan	83	30	52.2	2.68	T.
Jackson	90	33	54.9	1.25	
Jeddo	88	30	52.4	1.95	
Kalamazoo	89	34	56.6	1.97	
Lansing	88	33	53.3	2.29	
Lapeer	89	23	55.0	0.58	
Lathrop	82	22	47.4	3.83	1.5
Ludington	78	34	53.0	3.20	
Luzerne	83	26	48.4	3.87	1.0
Mackinaw City	81	30	48.5	3.53	

TABLE II.—*Meteorological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Michigan—Cont'd.	°	°	°	*Ins.*	*Ins.*
Madison	88	32	55.6	0.62	
Mancelona	83	29	50.5	4.02	T.
Manistee	83	28	52.2	2.79	
Manistique	70	29	48.5	3.34	1.0
Mayville	84	32	53.4	2.08	
Middle Island *[10]	76	36	51.8	......	
Midland	84	29	50.9	......	
Mottville	94	29	56.0	1.21	
Mount Clemens	89	29	55.0	1.16	
Mount Pleasant *b*	85	30	51.4	2.37	
Muskallonge Lake *[10]	71	24	47.4	......	
Muskegon	78	32	53.2	2.02	
Newberry	75	25	46.3	3.34	
North Manitou Island *[10]	78	34	52.4	......	
North Marshall	89	30	53.3	2.29	
Northport	82[c]	35[c]	50.2[c]	2.72	T.
Old Mission	79	34	52.0	2.87	
Olivet	85	34	54.4	2.57	
Omer	85	21	49.9	3.48	
Ottawa Point *[10]	74	31	51.6	......	
Ovid	85	31	53.6	1.80	
Owosso	89	31	54.0	2.89	
Parkville	......	......	......	2.29	
Pentwater *[10]	81	40	58.1	......	
Petoskey	82	30	50.7	2.74	0.5
Plymouth	90	31	55.2	1.51	
Point Au Barques *[10]	88	34	54.8	......	
Point Betsey *[10]	70	38	53.8	......	
Port Austin	84	28	51.8	3.20	
Powers	89	21	49.0	2.57	
Reed City	86	22	49.6	2.14	T.
Rockland *g*	82	25	47.8	1.90	
Rogers City	87	29	50.6	3.81	
Romeo	90	31	53.5	0.88	
Saginaw	86	30	52.6	2.01	
St. Ignace	70	27	48.2	2.04	
St. Johns	89	32	54.7	2.23	T.
Sandbeach *a*	88	30	51.6	3.07	
Ship Canal *[10]	76	28	48.6	......	
Sidnaw	76	20[f]	50.0[e]	2.62	
Somerset	89	31	53.8	1.76	
South Haven	88[d]	33[c]	55.8[d]	1.27	
Stanton	88	28	54.0	......	
Sturgeon Point *[10]	87	35	53.6	......	
Thomaston	78	20	48.5	1.78	4.0
Thornville	86	31	54.6	1.67	
Thunder Bay Island *[10]	76	34	51.4	......	
Traverse City	80	37	52.4	3.01	
Two Heart River *[10]	74	21	47.6	......	
Valley Center	81	19	49.9	1.21	
Vandalia	92	35	57.1	1.62	
Vermillion Point *[10]	70	20	44.1	......	
Wasepi	87	31	55.0	1.22	
Waverly	93	27	52.2	1.28	
West Harrisville	83	29	50.6	3.36	
Wetmore	78	23	47.0	3.51	0.2
White Cloud	83	29	52.0	2.51	
Ypsilanti	85	31	53.8	1.36	
Minnesota.					
Ada†	85	14	47.4	1.09	0.5
Albert Lea	88	23	53.2	1.05	
Alexandria †	87	24	49.6	1.36	1.0
Beardsley	91	16	49.2	2.50	
Bingham Lake	......	18	......	2.44	
Bird Island	85	25	50.6	1.62	
Blooming Prairie †	88	24	51.8	1.10	
Bonniwell	84	24	52.1	2.00	
Caledonia †	86	26	54.6	0.32	
Camden	90	18	49.5	0.76	
Collegeville	83	27	51.4	1.12	0.8
Crookston †	84	16	47.6	......	T.
Detroit City	90	......	......	2.05	T.
Faribault	88	26	52.8	1.73	
Farmington †	86	20	49.4	2.62	
Fergus Falls †	84	23	49.4	1.85	T.
Glencoe	87	17	51.8	1.88	
Grand Meadow †	90	24	51.4	0.85	T.
Koochicking	80	20	45.0	2.12	
Lake City	87	26	53.3	1.86	
Lakeside †	85	16	50.0	2.29	
Lake Winnibigoshish	79	21	45.0	1.27	
Lambert †	84	11	45.8	0.55	
Lawrence	80	22	52.0	......	
Leech Lake	82	20	47.2	1.49	1.8
Lesueur *[1]	90	24	52.2	3.35	
Long Prairie	85	18	48.1	1.04	1.0
Luverne†	88	22	51.5	2.41	
Lynd	90	19	49.8	0.76	
Mapleplain	......	......	......	1.66	T.
Maplewood *[1]	81	32	52.8	......	
Milan†	92	17	50.4	1.12	
Minneapolis *a*	84	24	51.8	1.67	T.
Minneapolis *b*[1]	85*	23	50.3	1.71	
Minnesota City *†[1]	90	24	54.7	0.81	
Montevideo †	90	21	51.5	......	T.
Morris	87	24	50.3	1.47	T.
Minnesota—Cont'd.	°	°	°	*Ins.*	*Ins.*
Mount Iron	70	18	42.8	2.24	......
New London	87	27	48.6	0.40	
New Richland *[1 e]	88	30	52.2	......	
New Ulm†	89	26	51.6	2.21	
Park Rapids †	84	15	46.7	1.27	1.4
Pine River	80	26	47.3	1.44	T.
Pleasant Mounds	88	23	53.6	1.70	
Pokegama Falls	82	14	45.7	1.27	
Redwing	......	......	......	4.51	
Reeds	......	......	......	1.30	
Rolling Green	87	22	53.2	1.40	
Roseau	84	10	43.9	1.57	0.5
St. Charles†	88	22	53.3	1.15	
St. Cloud	76	25	49.6	1.69	T.
St. Olaf	86	20	48.4	1.83	
St. Peter	85	30	55.2	3.32	
Sandy Lake Dam	77	20	46.8	1.33	T.
Shakopee[6]	79*	28	52.5	1.82	
Spring Park	......	......	......	1.92	
Tower †	76	17	40.1	2.05	0.5
Two Harbors†	74	26	48.1	2.86	T.
Wabasha *[1]	85	28	53.3	1.27	
Willmar †	84	25	49.8	0.15	T.
Worthington	86	24	52.0	1.82	
Zumbrota[1]	86*	20	52.5	......	
Mississippi.					
Aberdeen †	93	30	64.9	0.70	
Agricultural College	92	46	70.9	2.55	
Austin†	91	33	66.4	1.63	
Batesville†	92	30	65.2	0.44	
Bay St. Louis	82	52	71.2	1.37	
Biloxi †	87	52	70.8	1.83	
Briers	87	48	69.3	3.88	
Brookhaven †	99	42	71.4	0.75	
Canton †	93	40	69.3	3.06	
Columbus *a* †	......	......	......	1.85	
Columbus *b* †	97	36	68.2	1.57	
Corinth	94	35	67.1	0.82	
Crystal Springs †	95	42	70.5	2.05	
Edwards[4]	92	42	70.6	1.77	
Enterprise	......	33	......	2.05	
French Camps	95	31	65.8	2.31	
Greenville *a*	85	44	67.7	1.75	
Greenville *b* †	91	41	69.8	2.20	
Greenwood	87	44	67.6	3.10	
Hattiesburg †	93	44	70.0	0.38	
Hazlehurst †	96	43	70.6	1.33	
Hernando	93	40	69.4	0.73	
Holly Springs †	91	43	69.6	0.75	
Jackson †	92	36	67.2	2.29	
Lake†	93	36	66.0	1.65	
Leakesville†	98	48	71.4	2.26	
Logtown†	90	48	70.8	2.48	
Louisville†	96	35	69.2	2.87	
Macon†	92	35	66.8	0.81	
Magnolia†	94	42	70.6	2.42	
Mayersville	91	42	67.6	2.00	
Meridian †	92	36	68.8	1.16	
Natchez†	96	44	72.0	1.65	
Okolona†	92	37	67.4	0.68	
Palo Alto	93	38	69.0	2.81	
Pontotoc	94	40	68.8	1.74	
Port Gibson †	96	39	69.2	0.40	
Rosedale	89	37	64.1	2.48	
Stonington *[1 e]	90	44	69.4		
Thornton	90	45	72.8	2.08	
Tupelo†	......	......	......	0.60	
University	94	37	69.8	1.76	
Water Valley *†[1]	95	34	66.2	3.08	
Waynesboro *b* †	92	42	69.4	0.35	
Woodville†	90	48	71.1	2.18	
Yazoo City†	99	36	68.8	1.60	
Missouri.					
Appleton City	92	34	63.8	1.15	
Arthur *[3]	......	28	59.3	0.63	
Avalon	91[h]	35[h]	62.8[h]	0.20	
Birchtree	91	28	62.0	0.52	
Bolckow	......	......	......	0.77	
Boonville†	......	......	......	0.70	
Brunswick	88	32	61.3	T.	
Carrollton†	89	35	63.8	0.14	
Conception	88	35	60.6	0.46	
Cowgill *[5]	98	34	60.8	0.70	
Darksville †	91	35	62.9	0.00	
Downing	......	......	......	0.11	
East Lynne *[3]	......	27	56.8	0.67	
Edgehill *[5]	90	28	60.0	0.86	
Eightmile *[1]	90	32	62.2	0.55	
Eldon *[1]	90[e]	29	60.8[e]	0.90	
Elmira	96[e]	25[e]	62.6[e]	0.55	
Emma *[3]	......	40	59.8	0.12	
Fairport	......	......	......	1.02	
Farmersville	......	......	......	0.21	
Fayette	95	32	64.6	0.57	
Fulton	......	......	......	1.11	
Gallatin *[1]	90	33	62.8	0.70	
Missouri—Cont'd.	°	°	°	*Ins.*	*Ins.*
Glasgow	93	29	63.9	0.13	
Gordonville *[3]	......	33	56.1	0.89	
Gorin	......	......	......	0.20	
Halfway	90	33	62.5	1.55	
Harrisonville†	96	29	62.6	0.47	
Hastain	91	28	64.2	0.33	
Hermann†	......	......	......	0.52	
Houston	93	27	62.0	0.57	
Houstonia	......	......	......	0.45	
Humansville	95	28	66.4	0.80	
Irena	......	......	......	0.71	
Ironton†	96	26	61.2	1.13	
Jefferson City†	89	33	64.4	1.17	
Kidder	92	29	61.6	0.88	
Lamar†	95	30	66.8	0.90	
Lamonte	......	......	......	1.11	
Lebanon	93	35	66.1	1.21	
Lexington†	93	31	64.0	0.25	
Liberty	92	29	63.2	0.68	
McCune†	......	......	......	0.69	
Malden	94[c]	31[c]	65.0[c]	0.60	
Mansfield	......	......	......	0.60	
Marblehill	......	27	......	0.53	
Marshall†	93	35	62.9	0.23	
Maryville	99	30	59.0	0.77	
Mexico†	93	32	63.6	0.65	
Mineralspring	88	34	63.8	1.16	
Montreal *[1]	89	35	61.5	1.04	
Mount Vernon	98	31	68.5	0.68	
Neosho	91	28	63.8	......	
Nevada *[1]	91	28	65.1	0.46	
New Haven *[1]	90	40	65.2	0.70	
New Palestine *†[1]	89	39	64.9	0.76	
Oakfield	91	36	65.2	1.05	
Oakmound	......	......	......	0.40	
Oakridge	......	......	......	1.35	
Olden†	91	32	63.4	0.93	
Oregon *a*	93	34	62.5	1.23	
Oregon *b*	90	33	59.3	1.25	
Osceola†	......	......	......	0.94	
Oto	......	......	......	1.00	
Palmyra *[5]	92	32	63.1	0.47	
Phillipsburg *†[1]	93	33	62.8	1.53	
Pickering *[3]	93	27	56.6	0.53	T.
Platte River *[3]	88	28	54.8	0.91	
Poplar Bluff	92	29	63.2	1.05	
Potosi	87	23	55.0	0.43	
Princeton	92	30	60.8	1.19	
Rhineland	89	31	62.8	0.79	
Richmond	90	36	64.0	0.33	
Rolla	......	......	......	0.71	
St. Charles	91	35	64.3	0.34	
St. James *[3]	......	38	60.4		
St. Joseph†	......	......	......	0.73	
St. Louis	92	31	60.9	0.85	
Sarcoxie *[3]	92	33	56.6	0.94	
Sedalia	95	27	61.6	1.55	
Seymour *[1]	88	36	60.9	0.90	
Shelbina	......	......	......	0.20	
Sikeston	95	34	64.4	1.84	
Steffenville	......	......	......	1.00	
Stellada†	93	28	63.4	1.48	
Sublett	90	27	61.2	0.09	
Trenton	89	32	60.4	0.33	
Vichy	92	20	64.0	0.76	
Virgil City	......	......	......	0.80	
Warrenton	94	32	64.2	1.01	
Wheatland	......	......	......	0.51	
Willow Springs	93	28	62.0	0.89	
Zeitonia *[1]	95	32	60.3	0.57	
Montana.					
Billings	82	25	49.9	1.03	1.3
Bozeman†	76	22	45.0	2.92	
Bozeman Exper. Stat'n.	67	23	44.6	2.71	
Butte†	75	20	43.6	1.10	T.
Castle	72	15	41.5	2.31	3.4
Chinook†	81	18	46.2	1.23	
Choteau	86	16	46.2	0.32	2.0
Columbia Falls	68	21	42.5	0.84	3.0
Dupuyer	80	14	46.8	0.60	6.0
Fort Benton	82	24	50.8	0.86	
Fort Custer†	88	21	48.2	1.28	4.7
Fort Keogh†	90	15	47.6	0.70	2.0
Fort Logan†	78	20	44.3	1.96	
Fort Missoula	74	24	46.6	1.24	T.
Glasgow	89	17	44.6	1.28	
Glendive†	93	23	49.2	0.60	1.0
Glenwood	71	18	42.8	2.15	......
Greatfalls†	84	26	50.4	0.67	2.0
Hogan†	70	19	45.2	1.00	10.0
Kalispell	71	21	43.6	0.57	
Kipp†	78	10	39.4	0.64	5.1
Lewistown	73	20	45.2	2.55	1.0
Livingston†	80	20	46.8	1.80	8.0
Manhattan †	70	17	44.2	0.97	
Martinsdale†	79	20	45.0	1.90	4.0

TABLE II.—*Meteorological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Montana—Cont'd.	°	°	°	*Ins.*	*Ins.*
Marysville †	74	19	44.0	0.97	7.0
Poplar	90	16	45.4	0.11	
Radersburg	......	......	......	1.35	
St Ignatius Mission	82	25	44.5	0.98	
St. Pauls †	82	14	46.6	0.19	
Troy	75[e]	22	46.5[d]	1.42	
Utica †	87	16	46.6	2.36	4.0
Virginia City †	70	21	42.9	1.75	3.5
Wibaux	76	20	46.8	T.	T.
Yale †	81	20	43.9	1.89	3.0
Nebraska.					
Agee *[1]	89	29	51.0	2.88	4.0
Albion	88	27	53.6	2.82	
Alliance	......	......	......	0.36	3.5
Ansley †	86	25	51.1	4.98	5.5
Arapaho *[1]	89	30	54.0	4.96	
Arborville *[1]	92	30	54.5	5.57	
Ashland *a* †	92	31	58.9	3.39	T.
Ashland *b* *[1]	93	23	58.3	2.70	....
Ashton	88	29	54.9	4.92	T.
Auburn *†[1]	93	30	59.5	2.37	
Aurora *[1]	94	32	56.9	5.58	
Beatrice †	90	28	58.7	3.92	
Beaver City †	94	28	57.2	4.81	T.
Benedict	......	......	......	5.36	
Benkelman	......	......	......	2.60	
Bluehill *[1]	92	33	57.6	5.90	
Brokenbow	......	......	......	4.03	4.0
Burchard	......	......	......	3.81	
Burwell	......	......	......	3.89	1.0
Callaway †	91	25	50.5	5.00	5.0
Camp Clarke	90	20	51.4	0.28	0.8
Central City	......	......	......	3.97	
Chester *[1]	90	30	55.5	6.16	
Columbus †	87	30	56.0	3.85	
Cornlea	......	......	......	3.85	
Creighton †	88	28	51.7	2.17	
Crete	91	31	58.9	4.23	
Culbertson	......	......	......	4.84	0.5
Curtis *a*	90	19	55.0	4.73	1.5
Dannebrog *[1]	90	35	58.0	5.68	
David City *†[1]	89	34	55.4	4.10	
Dawson	91	29	60.5	3.70	
Divide	......	......	......	4.88	
Dunning *[1]	84	20	53.8	1.78	6.5
Eden	......	......	......	2.66	
Edgar	......	......	......	6.82	
Elba	......	......	......	5.70	
Ericson *†[1]	87	30	51.2	3.84	
Ewing †	......	......	......	3.77	
Fairbury †	92	28	57.6	4.97	
Fairmont †	92	29	59.2	5.95	
Filley	......	......	......	3.59	
Fort Robinson	87	23	50.5	T.	T.
Franklin	97	28	59.2	5.99	
Fremont †	90	30	56.1	2.77	
Geneva †	91	30	57.4	5.79	
Genoa	89	30	55.8	4.12	
Gering †	88	16	50.2	0.10	1.0
Gothenburg	88	22	52.7	4.67	5.0
Grand Island *a* *[1]	99	33	57.8	5.72	
Grand Island *b*	89	32	55.9	6.28	
Greeley	......	......	......	2.00	
Haigler	......	......	......	1.80	3.0
Hartington †	91	28	54.6	1.94	
Harvard *[1]	93	32	54.9	4.27	
Hastings *[1]	91	31	54.3	5.82	
Hayes Center	......	......	......	3.22	7.0
Hay Springs	86	25	49.8	1.20	2.8
Hebron †	92	30	58.2	4.70	
Hickman	......	......	......	2.03	
Holdrege *b* *[1]	90	31	54.8	4.35	
Imperial *a* †	90	21	53.3	3.87	8.5
Indianola (near)	......	......	......	4.86	
Kearney	......	......	......	5.70	T.
Kennedy	88	24	50.6	1.49	10.0
Kimball †	84	20	50.5	0.88	8.0
Kirkwood *[1]	90	29	50.9	......	10.0
Lexington †	90	18	53.3	4.13	
Lincoln *b* †	90	33	59.8	2.76	......
Lincoln *d*	92	33	60.3	2.75	T.
Lodgepole †	86	19	48.2	1.50	15.0
Loup *a* *[1]	88	30	53.2	4.28	
Loup *b* *[1]	88	28	52.2	5.75	
Lynch *†[1]	90	28	52.8	2.58	2.0
Lyons	......	......	......	2.84	
McCook *[1]	87	30	56.2	4.65	
McCool	......	......	......	5.71	
Madison *[1]	85	30	54.4	3.16	
Madrid	......	......	......	2.63	6.0
Marquette	......	......	......	4.79	
Minden *a*	92	28	54.8	7.34	
Minden *b*	......	......	......	6.90	
Monroe	......	......	......	3.55	
Nebraska City *	91	34	61.6	2.76	
Nemaha *[1]	94	30	56.4	2.55	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Nebraska—Cont'd.	°	°	°	*Ins.*	*Ins.*
Nesbit	87	24	50.4	6.49	12.0
Norfolk *a* †	85	30	55.0	2.97	
Norman	......	......	......	6.73	
North Loup †	87	28	51.6	4.65	......
Oakdale †	88	27	52.0	2.33	
Odell *[5]	89	28	56.8	4.61	
O'Neill †	87	25	50.6	3.84	
Ord	88	28	51.7	4.36	
Osceola	......	......	......	5.30	
Ough †	......	......	......	3.77	0.6
Palmer *b*	......	......	......	4.68	T.
Ravenna *a*	88	29	55.0	4.96	
Ravenna *b* *[1]	90	30	54.2	5.60	
Redcloud *a*	......	......	......	5.21	
Republican *[1]	92	32	54.7	3.76	
Rulo *[1]	98	34	61.1	2.10	
St. Libory	88	32	56.6	5.14	
St. Paul	88	31	56.1	5.35	
Salem	......	......	......	1.50	
Santee Agency †	92	31	54.6	2.09	
Sargent	......	......	......	5.25	5.0
Schuyler	......	......	......	3.64	
Seneca	......	......	......	0.70	7.0
Seward *[1]	88	36	57.6	3.57	
Springfield *[1]	92	30	57.4	3.05	
Springview	87	27	50.6	......	12.0
Stanton *[1]	90	30	53.8	3.29	
State Farm	93	30	59.9	2.62	
Stockham	......	......	......	5.00	
Strang *[1]	90	30	57.4	5.40	
Stratton	......	......	......	4.35	
Stromsburg	......	......	......	4.94	
Superior *[5]	90	30	57.8	4.87	
Sutton	88[b]	32[c]	53.8[c]	8.33	
Syracuse	......	......	......	3.46	
Tecumseh *b* †	......	......	......	3.49	
Tekamah	93	27	57.6	2.01	
Thedford *[1]	88	26	48.4	3.10	11.0
Turlington †	88	27	55.3	3.56	
Valentine †	89	26	52.0	2.01	
Valparaiso	......	......	......	2.01	
Wakefield	89	28	54.5	2.98	
Wallace	......	......	......	0.60	3.0
Weeping Water *[1]	86	30	54.9	3.09	
Westpoint †	89	30	57.0	3.13	
Whitman	......	......	......	0.83	6.0
Wilber *[1]	88	30	59.1	4.22	
Willard	......	......	......	5.28	
Wilsonville *[1]	90	28	57.1	3.90	
Wisner	......	......	......	3.09	
Woodlawn	......	......	......	2.68	
York *[1]	91	30	56.4	4.52	
Nevada.					
Austin	67	20	45.2	2.76	8.0
Battle Mountain *[1]	78	26	45.0	1.90	
Beowawe *[1]	78	20	46.3	0.50	T.
Candelaria	80	29	51.6	0.99	2.0
Carlin *[1]	77	20	44.4	1.10	T.
Carson City	77	21	47.2	1.56	
Cranes Ranch	......	......	......	2.68	1.5
Darrough Ranch	......	......	......	2.19	5.0
Downeyville	84	30	54.4	1.54	
Elko *[5]	72	25	45.1	2.10	
Elko (near)	71	10	45.5	2.10	......
Ely	66	11	39.7	2.86	6.0
Fenelon *[1]	63	15	39.1	3.58	13.0
Golconda *[1]	76	24	45.8	1.32	T.
Halleck *[1]	68	15	40.7	1.00	2.5
Hamilton	73	9	40.6	1.86	10.9
Hawthorne *a* *[8]	74	36	52.5	1.22	
Hawthorne *b*	76	30	51.4	1.22	
Hot Springs *[1]	73	33	52.7	0.08	
Humboldt *[8]	79	28	50.0	1.02	
Keysers Springs	......	......	......	1.05	
Lewers Ranch	75	24	48.0	4.41	3.0
Los Vegas	84	35	56.8	0.16	
Lovelock *[1]	72	30	50.9	1.00	
McGill	71	12	41.4	2.16	6.0
Martins	74	22	47.2	0.73	
Midas	68	26	47.1	1.55	9.0
Mill City *[1]	82	28	46.6	0.40	
Monitor Mill	66	13	40.6	2.15	......
Osceola	74	25	45.6	2.16	6.0
Palisade *[8]	70	20	52.1	1.50	
Palmetto	73	23	45.5	2.10	8.0
Reno *[8]	79	29	45.0	......	
Reno State University	74[d]	24	47.6	0.96	
Ruby Valley	......	......	......	2.92	6.0
St. Clair	78	27	47.8	1.95	
St. Thomas	95	34	63.2	1.55	
San Antonio	85	25	50.9	2.05	
Silver Peak	81	30	53.2	0.26	T.
Tecoma *[1]	70	24	45.0	1.43	6.0
Toano *[1]	70	20	43.1	3.81	9.0
Tuscarora	75	15	40.5	1.55	3.2
Tybo	69	28	48.6	0.60	2.0

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Nevada—Cont'd.	°	°	°	*Ins.*	*Ins.*
Verdi *[1]	86	27	45.6	0.45	T.
Wadsworth *[1]	80	36	48.4	1.78	
Wells	66	10	42.6	2.92	
New Hampshire.					
Concord	83	18	47.3	0.58	
Durham	88	23	50.4	0.49	
Grafton †	84	15	46.2	1.43	
Hanover	78	20	46.8	1.29	
Keene	85	19	47.7	1.86	
Lancaster	80	16	44.6	2.16	
Nashua	88	19	49.1	1.00	
Newton	87	22	49.2	0.15	
North Conway	85	17	48.2	1.30	
Peterboro	83	16	46.9	0.64	
Plymouth	83	16	45.4	1.87	
Sanbornton †	81	21	47.7	1.25	
Stratford	87	16	49.5	1.37	
Warner	......	......	......	0.62	
West Milan	81	12	44.8	1.21	
New Jersey.					
Asbury Park	......	31	......	2.89	
Barnegat	......	34	.. .	3.53	
Bayonne	91	31	57.7	1.31	
Belvidere	90	26	55.3	2.55	
Beverly †	92	29	57.0	2.31	
Billingsport *[1]	86	36	56.3	2.81	
Blairstown	87	28	54.2	2.61	
Boonton	88	27	54.8	1.35	
Bridgeton	85	37	58.2	3.75	
Camden	86	32	56.0	2.21	
Cape May C. H. †	85	35	58.1	5.93	
Charlotteburg	88	22	51.8	1.95	
Chester	84	30	52.9	1.95	
Clayton	89[f]	29	58.8[c]	2.62	
College Farm †	90	28	56.4	1.59	
Deckertown	89	25	53.6	1.53	
Dover	89[d]	24[c]	53.3[d]	1.67	
Egg Harbor City	89	28	56.0	3.98	
Elizabeth †	89	29	55.4	1.33	
Englewood	90	23	54.0	0.87	T.
Franklin Furnace	85	26	52.3	1.78	
Freehold	83	32	54.9	3.15	
Friesburg	......	......	......	2.97	
Gillette	87	26	53.5	1.37	
Hammonton	......	......	......	2.75	
Hanover	83	26	53.2	1.45	
Hightstown	88	30	55.9	2.36	
Imlaystown	89	32	57.2	2.94	
Junction	......	......	......	1.82	
Lambertville	88	28	54.0	1.96	
Moorestown	90	30	57.0	2.60	
Newark *b* †	89	34	55.4	1.65	
New Brunswick *a*	91	28	57.3	1.66	
New Brunswick *b*	88	29	54.4	1.56	
Newton	87	27	52.6	1.20	
Ocean City	......	......	......	4.63	
Oceanic	87	33	57.0	2.09	
Paterson	90	32	56.7	1.82	
Perth Amboy	87	29	55.0	1.52	
Plainfield	88	26	54.5	1.15	
Port Norris	82	33	57.7	3.76	
Rancocas	......	......	......	2.12	
Readington *[6]	86	32	60.9	......	
Rivervale	92	23	53.7	1.06	
Roseland	90	26	54.6	1.72	
Sergeantsville	90	27	56.2	1.81	
Somerville	95	23	56.0	0.95	
South Orange	85	29	53.8	1.11	
Staffordville	......	......	......	4.77	
Toms River	91	25	56.4	3.78	
Trenton	88	32	58.7	2.01	
Vineland	92	30	57.9	3.51	
Woodbine	87[d]	26[d]	56.8[d]	5.76	
New Mexico.					
Albert	......	......	......	1.79	T.
Albuquerque †	79	25	54.8	1.44	......
Alma	80	29	55.2	1.95	
Angus V. V. Ranch	73	15	48.7	1.70	4.0
Aztec †	78	18	48.6	1.53	
Bernalillo †	85	26	55.2	1.77	T.
Bluewater	74	16	49.0	3.20	.....
Buckmans	66	4	38.8	3.51	3.5
Clayton	85	24	50.4	1.67	T.
Deming *[8]	91	35	60.8	1.57	
East Lasvegas †	76	20	49.0	1.94	2.0
Eddy	86	28	61.2	0.20	
Engle †	82	27	56.9	0.74	T.
Espanola †	78	20	52.4	0.87	3.0
Fort Bayard	79	23	54.7	1.90	5.0
Fort Union	75	23	51.0	6.43	T.
Fort Wingate	79	20	50.8	3.67	......
Galisteo †	86	23	54.4	1.50	
Gallinas Spring †	80	23	53.4	1.51	
Gila	86	32	59.4	1.38	5.3
Hillsboro	81	28	56.5	2.57	
Las Cruces †	86	26	57.9	0.73	

TABLE II.—*Meteorological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean	Rain and melted snow.	Total depth of snow.
New Mexico—Cont'd.	°	°	°	*Ins.*	*Ins.*
Lordsburg*[8]	85	35	61.9	......	
Los Lunas	90	20	56.4	0.80	
Lower Penasco	82	25	56.4	1.05	2.0
Puerto de Luna†	84	26	56.3	0.80	
Raton	80	18	48.1	3.57	T.
Rincon†	84	29	50.0	0.46	T.
Roswell†	90	21	58.5	0.44	
San Marcial†	86	29	59.9	1.88	
Shattucks Ranch	83	21	55.6	0.68	T.
Socorro	82	27	56.2	1.18	T.
White Oaks†	75	26	53.4	0.99	3.0
Winsors Ranch	68	3	42.0	3.39	6.0
New York.					
Adams	......	......	......	0.42	
Addison	86	24	51.3	0.94	T.
Akron	......	......	......	1.34	
Alfred	82	24	50.1	1.02	T.
Angelica†	82	21	51.0	0.65	
Appleton	85	29	52.0	1.05	
Arcade	80	26	50.6	0.97	
Arkwright	76	33	52.8	......	
Atlanta	......	......	......	1.18	
Auburn	86	29	53.3	0.75	
Avon	86	24	51.8	0.72	
Baldwinsville	86	30	52.2	0.65	
Bedford	89	24	53.1	2.03	
Big Sandy*[10]	76	26	51.1	......	
Binghamton†	85	24	51.0	0.82	T.
Bolivar	83	18	49.2	0.70	T.
Bouckville	81	25	50.8	0.68	
Boyds Corners	......	......	......	2.01	
Brentwood	87	22	53.8	1.50	
Brooklyn	85	35	56.8	1.69	
Canajoharie	83	30	50.4	0.74	
Canton	79	17	47.6	0.64	
Carmel	85	24	52.4	0.89	
Catskill	88	27	53.2	0.81	
Cedar Hill	......	......	......	0.95	
Charlotte*[10]	74	27	47.6	......	
Chenango Forks	......	......	......	1.00	
Cherry Creek	......	......	......	2.28	
Cooperstown†	80	25	48.5	0.64	
Cortland	84	24	52.4	0.72	
Dekalb Junction	......	......	......	0.86	
Dryden	83	24	48.8	1.00	T.
Eagle Mills	......	......	......	1.02	
Easton	......	......	......	1.34	
Elmira	86	27	53.6	0.65	
Fayetteville	......	......	......	0.42	
Fleming	85	33	54.5	0.80	
Fort Niagara†	85	32	54.2	1.05	
Franklinville	83	19	50.4	0.75	T.
Fulton	......	......	......	0.46	
Garrattsville	80	23	49.2	0.59	
Glens Falls	83	23	49.7	1.52	
Gloversville	84	22	49.0	1.59	
Greenwich	83	22	50.3	1.73	
Haskinsville	......	......	......	0.68	
Honeymead Brook	84	24	50.3	0.93	
Humphrey†	82	27	52.4	0.60	T.
Ithaca	84	28	52.1	0.88	T.
Jamestown	82	25	51.2	0.69	T.
Kings Station	......	......	......	1.45	
Lake George	84	25	51.0	1.59	
Lake Placid	78	20	47.3	1.88	
Little Falls	84	24	49.0	1.31	
Lockport	80	30	51.8	0.81	
Lowville	80	18	49.4	1.34	
Lyndonville	......	......	......	0.95	
Lyons	85	32	53.2	0.48	
Madison Barracks†	76	21	50.5	0.80	
Middletown	86	32	52.6	0.73	
Mohonk Lake[1]	82	34*	52.8	1.06	
Mount Morris	......	......	......	0.60	
Napoli	......	......	......	0.52	
Newark Valley	......	......	......	0.36	
New Lisbon	82	18	47.4	0.73	
Niagara Falls	......	......	......	1.31	
North Hammond†	76	20	49.6	0.78	
North Lake	77	18	45.9	2.08	
Number Four†	78	18	47.4	2.38	
Ogdensburg	79	25	50.4	1.19	
Oneonta	82	24	50.2	0.46	
Oxford	83	20	48.8	0.80	
Palermo	83	24	50.3	0.40	
Penn Yan	88	30	53.3	0.62	T.
Perry City	85	22	49.4	0.86	
Phœnix	......	......	......	0.90	
Pine City	......	......	......	0.91	
Pittsford	85	28	52.2	0.97	
Plattsburg Barracks†	88	25	47.9	0.52	
Port Jervis	86	25	51.3	1.18	
Potsdam	80	19	48.2	0.55	
Poughkeepsie	89	22	51.9	0.13	
Primrose	88	25	53.0	1.94	
Ridgeway	83	31	53.1	1.07	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
New York—Cont'd.	°	°	°	*Ins.*	*Ins.*
Rome	80	25	47.1	0.38	
Romulus	87	32	53.4	1.21	
Rose	......	......	......	0.86	
St. Johnsville	81	24	49.3	0.93	
Saranac Lake	82	19	47.2	1.41	
Schenevus	......	......	......	0.73	
Scottsville	......	......	......	0.68	
Setauket†	86	36	56.0	1.79	
Skaneateles	......	......	......	0.95	
South Canisteo	84	20	49.5	1.04	T.
Southeast Reservoir	......	......	......	0.93	
South Kortright†	79	18	48.2	0.98	
Straits Corners	86	21	49.9	0.52	T
Ticonderoga	81	26	50.6	2.19	
Victor	......	......	......	0.83	
Wappingers Falls	85	26	52.6	1.21	
Warwick	......	......	......	1.63	
Watkins	88	26	53.6	0.52	T.
Waverly†	88	20	51.8	0.79	
Wedgwood	87	26	52.4	0.74	T
Westfield	82	30	55.0	1.72	
Westpoint†	90	20	50.0	1.43	
Willetspoint	90	32	56.0	0.70	
North Carolina.					
Abshers	92	31	61.3	6.52	
Asheville†	87	33	59.0	2.70	
Beaufort†	84	49	67.6	8.77	
Biltmore†	87	27	58.0	2.89	
Bryson City†	......	......	......	2.43	
Chapelhill†	90	38	62.4	3.32	
Edenton	82	41	64.0	5.66	
Experimental Farm	88	44	62.8	3.23	
Fairbluff†	......	......	......	1.91	
Fayetteville†	89	39	63.1	2.17	
Flatrock	80	26	56.6	5.46	
Goldsboro†	89	42	64.6	3.44	
Greensboro†	84	38	60.8	1.51	
Greenville	82	41	63.7	6.76	
Henderson†	92	42	61.9	4.65	
Highlands	77	28	54.6	2.83	
Jacksonville	89	44	65.7	7.70	
Lenoir*†[1]	82	36	59.9	5.31	
Linville†	74	23	51.3	3.57	
Littleton†	86	37	61.2	4.38	
Louisburg†[4]	87	38	61.9	2.72	
Lumberton†	88	41	64.2	2.54	
Lynn†	84	38	62.1	4.69	
Mana	......	......	......	3.14	
Marion	90	35	61.7	5.48	
Moncure†	88	38	63.0	1.81	
Monroe†	87	35	63.0	1.91	
Morganton	91	33	62.2	6.70	
Mountairy†	86	32	59.6[g]	5.01	
Mount Pleasant	90	37	63.6	1.02	
Murphy†	......	......	......	2.59	
Newbern†	82	50	66.5	4.89	
Oakridge†	86	37	61.0	1.76	
Pantego*[5]	78	42	62.0	8.42	
Pittsboro†	84	36	61.2	2.40	
Rockingham†	91	40	64.5	3.89	
Roxboro†	88	33	59.4	3.55	
Salem†	90	34	61.2	2.29	
Salisbury†	94	39	63.3	2.29	
Saxon†	90	32	61.4	2.92	
Selma	88	39	63.4	0.55	
Settle	90	35	62.6	3.86	
Sloan†	90	42	65.4	5.35	
Soapstone Mount†	88	34	60.8	3.14	
Southern Pines *a*†	92	40	64.9	1.87	
Southern Pines *b*	90	41	65.3	1.77	
Southport†	85	48	67.1	4.49	
Springhope*[1]	82	40	60.0	2.25	
Tarboro	93	35	62.9	3.82	
Waynesville†	81	28	54.8	1.67	
Weldon†	87	37	62.3	4.12	
Willeyton	86	38	61.9	5.37	
North Dakota.					
Amenia	88	11	46.2	1.06	2.5
Ashley†	88	12	46.9	0.66	T.
Bottineau	88	11	43.2	0.52	T.
Buxton	88	9	46.4	0.92	0.1
Churchs Ferry	84	13	45.2	1.05	0.2
Coalharbor†	90	15	46.4	0.70	1.5
Devils Lake†	81	23	48.4	0.93	
Dickinson	89	6	45.0	0.15	1.5
Ellendale	86	18	47.8	0.99	
Falconer	92	10	45.9	0.43	3.2
Fargo†[6]	84*	12	46.9	1.81	
Forman†	92	18	47.4	2.19	
Fort Berthold	91	24	53.7	0.05	0.5
Fort Yates†	91	16	47.9	0.50	2.0
Gallatin†	88	9	44.4	0.54	
Glenullin	90	12	44.1	0.15	
Goetz	89	12	47.2	0.46	
Grafton†	80	7	44.8	0.35	3.5
Grand Rapids†	89	10	46.2	1.31	0.5

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
North Dakota—Cont'd	°	°	°	*Ins.*	*Ins.*
Hamilton	85	12	43.4	0.98	T.
Jamestown†	88	20	50.0	0.11	1.1
Larimore†	86	10	44.8	0.86	
McKinney	90	10	43.8	0.10	
Mayville	80	13	47.3	0.75	
Medora†	89	14	45.8	0.52	1.0
Milton†	80	11	42.4	1.60	
Minnewaukon	83	15	46.1	0.65	
Minot†	93	10	46.8	0.68	0.2
Minto†	83	6	44.3	0.17	
Napoleon†	87	12	46.2	0.55	2.5
New England City	82	15	42.6	0.20	2.0
Oakdale†	74	20	47.8	0.37	3.7
Portal	86	12	43.4	0.50	
Power†	86	15	46.4	1.91	
St. John†	77	17	44.0	1.13	T.
Sheyenne	87	12	46.6	0.75	0.1
Steele†	88[d]	12[d]	46.0[d]	0.60	6.0
Towner†	84	8	45.3	......	
University	85	11	46.2	0.85	T.
Valley City†	82	18	42.8	0.62	T.
Wahpeton†	88	18	50.6	2.50	T.
White Earth	80	10	44.3	0.50	
Whites Ranch	91	15	47.2	0.60	3.0
Wildrice†[2]	......	......	44.2	2.29	T.
Woodbridge†	79	8	43.0	0.85	T.
Ohio.					
Akron	85	29	55.8	1.65	
Ashland	84	32	53.9	0.67	
Ashtabula	84	32	55.2	2.21	
Atwater	......	......	......	0.60	
Bangorville	86	30	58.0	0.77	
Bellefontaine	......	......	......	1.25	
Bement	......	......	......	0.14	
Benton Ridge	92	30	58.2	1.15	
Bethany	89	38	62.8	0.87	
Bigprairie	86	25	56.9	0.51	
Binola	......	......	......	0.93	
Bissells	86	32	57.0	1.30	
Bloomingburg	89	31	59.4	0.14	
Bowling Green	90	31	56.6	0.86	
Cambridge	87	25	55.6	0.34	
Camp Dennison	90	29	60.2	0.56	
Canal Dover	86	27	55.2	0.26	
Canton†	87	31	56.5	0.35	
Cardington	......	......	......	0.18	
Carrollton	88	26	57.5	0.49	
Cedarville	......	......	......	0.77	
Celina	92	31	58.8	0.59	
Cherryfork	92	25	61.4	0.43	
Circleville	88	34	59.8	0.90	
Clarksville	89	30	60.8	0.48	
Cleveland *a*	83	36	5[illegible].8	1.55	
Cleveland *b*	86	36	56.0	1.38	
Coalton	90	23	57.6	0.12	
Colebrook	83	27	56.4	1.43	
Dayton *a*	93	28	60.4	1.26	
Dayton *b*†	......	......	......	1.55	
Defiance	92	31	58.0	0.74	
Delaware	87	29	57.0	0.38	
Demos	86	24	58.0	0.10	
Dupont	......	......	......	0.75	
Elyria	90	32	57.9	0.78	
Fairport Harbor*[10]	85	40	58.6	......	
Fayetteville	88	30	60.4	0.55	
Findlay	91	32	57.9	1.49	
Frankfort	87	29	57.0	0.80	
Garrettsville†	87	25	54.4	1.56	T.
Granville	88	27	56.8	0.58	
Gratiot	86	27	57.6	0.66	
Greenfield	84	34	59.9	0.50	
Greenhill	89	24	55.8	0.33	T.
Greenville	82	33	57.4	0.63	
Hackney	85	29	60.5	0.17	
Hanging Rock	91	31	60.6	0.34	
Hedges	......	......	......	0.25	
Hillhouse	85	29	55.2	2.35	
Hillsboro†	95	25	60.2	0.73	
Hiram	83	31	54.8	2.78	
Hudson	87	28	57.7	1.31	
Jacksonboro	94	33	62.2	1.30	
Kenton†	88	31	58.2	0.85	
Killbuck	89	25	55.5	1.23	
Lancaster	87	31	58.2	0.43	
Leipsic	88	29	55.0	0.20	
Levering	86	20	51.2	0.62	
Logan	95	23	59.2	0.28	
Lordstown	86	26	54.9	0.39	
McArthur	90	20	56.6	0.32	
McConnelsville†	93	26	59.6	0.56	
Mansfield†	......	......	......	0.69	
Marietta *b*	87	33	59.2	0.05	
Marion	91	30	59.8	0.53	
Medina	89	31	56.6	0.77	
Milfordton	91	25	56.8	0.68	
Milligan	93	21	57.0	0.35	

TABLE II.—*Meteorological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Ohio—Cont'd.	°	°	°	*Ins.*	*Ins.*
Millport	88	25	53.8	T.	T.
Montpelier	89	29	55.2	0.35	
Napoleon	89	29	56.2	0.67	
Neapolis				0.05	
New Alexandria	86	32	58.1	0.00	
New Berlin	87	27	56.1	0.50	
New Bremen	88	32	57.9	0.55	
New Comerstown	88	29	56.2	0.30	
New Holland	89	29	58.8	0.58	
New Paris	97	33	59.4	0.67	
New Waterford	88	25	55.7	0.21	
North Lewisburg	90	27	57.6	0.90	
North Royalton	87	33	58.7	0.62	
Norwalk	90	30	57.5	0.52	
Oberlin	89	31	59.0	0.60	
Ohio State University	88	28	58.0	0.57	
Orangeville	85	25	52.9	0.18	T.
Ottawa	90	32	59.2	0.44	
Pataskala†	92	24	58.4	0.60	
Perry				0.79	
Philo	88	32	59.8	0.40	
Plattsburg	90	32	60.5	0.23	
Pomeroy	90	29	59.2	0.33	
Portsmouth *a*†				0.40	
Portsmouth *b*	91	36	62.0	0.52	
Richwood	87	32	57.6	0.57	
Ridgeville Corners	91	28	55.8	0.19	
Ripley	87	34	61.1	1.29	
Rittman	84	25	53.6	1.38	
Rockyridge	91	32	58.6	1.93	
Rosewood	85	32	58.2	0.68	
Shenandoah	90	31	56.4	0.98	
Sidney *b*	88	32	57.8	0.94	
Sinking Spring†	85	31	60.1	0.35	
Somerset†	88	39	62.1	0.06	
Springboro				0.41	
Spring Valley	90	24	58.2	0.26	
Strongsville				0.87	
Sylvania	88	27	54.1	0.71	
Thurman	97	27	61.2	0.30	
Tiffin†	86	34	57.5	0.83	
Upper Sandusky	87	32	58.6	0.46	
Urbana	84	34	57.4	0.69	
Vanceburg	88	29	60.3	0.43	
Van Wert	90	31	56.9	0.38	
Vermillion	87	33	54.8	0.69	
Vickery	90	32	57.0	0.75	
Walnut				0.65	
Warren				0.50	
Warsaw	92	23	56.2	0.52	
Wauseon	94	31	57.0	0.77	
Waverly	93	25	59.8	0.36	
Waynesville	88	27	58.2	0.53	
Wellington	88	29	57.5	0.85	
Westerville[c]	84	30	57.5	0.43	
Willoughby				1.39	
Wooster *b*†	86	25	56.0	0.89	
Youngstown	85	28	52.8	0.25	T.
Zanesville†				0.34	
Oklahoma.					
Anadarko†	96	31	67.4	1.72	
Arapaho†	92	29	64.3	0.99	
Burnett†	92	32	64.4	1.61	
Clifton†	96	31	65.4	1.26	
Edmond	92	34	66.5	0.37	
Fort Reno†	98	33	64.4	1.28	
Fort Sill	91	34	66.1	2.73	
Guthrie	92	33	66.2	0.62	
Hennessey	96[c]	31[c]	68.7[c]	1.11	
Kingfisher[d]	96	32	66.6	0.95	
Mangum†	92	28	63.9	0.92	
Newkirk	92	33	66.4	1.65	
Norman†	94	32	66.5	1.38	
Prudence†	82	32	62.7	1.08	
Sac and Fox Agency†	95	29	65.4	1.00	
Stillwater†	94	30	64.2	0.97	
Waukomis	98	32	65.2	1.26	
Winnview				2.36	
Oregon.					
Albany *a*	81	32	52.6	2.45	
Arlington	82	28	53.6	0.01	
Ashland *b*	88	27	52.7	0.55	
Aurora *[8]	82	31	50.7	1.92	
Aurora (near)	82	29	51.8	1.82	
Bandon	89	32	53.7	4.02	
Bay City†	80	34	51.6	6.00	
Brownsville *[8]	85	38	54.7	2.26	
Burns	78	9	42.8	0.25	
Burns (near)	81	16	48.6	0.10	
Canyon City	75	25	49.6	0.49	
Cascade Locks	80	38	54.0	3.95	
Comstock *[8]	93	32	53.4	3.17	
Coquille River				3.67	
Corvallis	83	27	52.9	2.38	
Dayville†	80	21	50.0	0.28	
Eugene	82	32	52.0	2.62	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Oregon—Cont'd.	°	°	°	*Ins.*	*Ins*
Fairview	87	32	54.6	4.93	
Falls City	79	31	51.4	4.59	
Fife†	74	15	44.0	0.00	
Forest Grove	86	27	52.4	2.69	
Gardiner	81	38	55.3	3.15	
Glenora	83	30	52.0	6.39	
Government Camp	72	23	45.3	4.36	16.0
Grants Pass *a*†	89	25	53.8	1.92	
Happy Valley	78	11	44.3	0.39	
Heppner	80	26	50.0	0.08	
Hood River (near)	77	33	51.1	1.24	
Irvington				1.60	
Jacksonville	83	29	51.8	1.29	
Joseph	72	21	43.8	0.49	
Junction City *[8]	78	32	52.9	2.30	
Lafayette *[8]	78	34	53.8	2.29	
Lakeview†	74	23	46.3	0.36	
Langlois	94	35	56.4	8.18	
McMinnville	85	27	52.6	2.22	
Merlin *[8]	78	24	49.7	2.25	
Monmouth *[8]	85	34	54.6	1.43	
Monroe	82	33	52.4	2.86	
Mount Angel†	86	30	53.2	2.34	
Nehalem				5.18	
Newberg	87	27	52.6	2.38	
Newbridge	81	19	48.3	0.29	
Newport	85	37	55.0	2.20	
Pendleton	82	22	51.6	0.25	
Prineville	83	26	53.7	T.	
Riddles *[8]	80	28	51.5	0.73	
Riverside	79	13	44.8	0.15	
Salem *b*†	81	32	52.2	2.08	
Sheridan *[8]	85	32	55.7	2.54	
Silver Lake	88	10	43.0	0.23	
Silverton *[8]	84	30	50.3	2.34	
Siskiyou *[8]	85	35	55.5	0.60	4.0
Sparta	76	24	47.2	0.28	
Springfield *[8]	77	30	51.9	3.02	
Stafford		37		2.35	
The Dalles†	82	29	53.8	0.24	
Tillamook Rock L. H.				1.36	
Toledo	89	27	54.4	3.10	
Umatilla				0.04	
Vale	80	14	47.4	0.40	
Vernonia	89	30	53.4	2.92	
West Fork *[8]	70	30	49.8	4.25	
Weston	76	26	50.4	0.53	
Williams	82	33	50.8	1.31	
Pennsylvania.					
Altoona	86	30	56.4	0.71	
Aqueduct	95	28	55.6	2.34	
Beaver Dam				0.20	
Bethlehem				1.22	
Brookville†				0.53	
Browers Lock				2.37	
Cameron				0.86	
Canonsburg	95	33	60.9	0.09	
Carlisle	88	29	54.6	2.05	
Cassandra	81	30	51.1	0.39	T.
Cedarrun				1.42	
Centerhall†	87	20	52.4	1.78	T.
Chambersburg†	88[c]	23[c]	52.8[c]	2.19	
Coatesville	94	26	56.0	2.60	
Confluence†	86	26	53.0	0.43	
Coopersburg	88	30	56.4	2.65	
Davis Island Dam†				0.20	
Derry Station	88	31	56.2	0.44	
Doylestown				2.60	
Driftwood				1.26	
Duncannon				2.10	
Dushore				1.40	
Dyberry	87	19	49.1	0.97	T.
East Bloomsburg				1.38	
East Mauch Chunk	89	25	53.2	2.36	
Easton	83	30	54.4	1.85	
Edinboro *[1]	80	26	54.2		
Ellwood Junction†				0.04	
Emporium	85	24	52.0	0.94	T.
Everett	88	26	53.4	0.93	
Farrandsville				0.97	
Forks of Neshaminy *[1]	82	32	54.8	2.41	
Franklin	84	28	53.7	0.28	T.
Frederick				2.08	
Freeport†				0.29	
Girardville				1.98	
Grampian	82	28	52.6	0.68	T.
Greensboro†	87	21	56.8	T.	
Greenville	76	28	51.1	0.47	
Hallstead†	84	23	50.6	0.74	T.
Hamburg	89	28	56.8	1.79	
Hollidaysburg	91	23	54.9	0.57	
Huntingdon *a*†	88	24	52.6	1.74	
Huntingdon *b*				1.43	
Indiana				0.57	
Irwin				0.32	T.
Johnstown†	86	28	55.4	0.72	T.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Pennsylvania—Cont'd.	°	°	°	*Ins.*	*Ins.*
Karthaus				0.06	
Keating				0.74	
Kennett Square	92	29	56.6	2.19	
Lansdale				2.48	
Lawrenceville	84[d]	22[d]	50.0[d]	1.45	
Lebanon	90	28	54.6	2.36	
Leroy†	81	28	52.0	1.30	T.
Lewisburg	89	25	53.4	2.08	
Lock Haven *a*†	87	29	55.8	0.89	
Lock Haven *b*				0.77	
Lock No. 4†				0.08	
Lycippus	85	32	57.8	0.60	
Mifflin				2.17	
Oil City†				0.37	
Ottsville				1.54	
Parker†				0.77	
Philadelphia *b*	89	38	58.3	2.42	
Point Pleasant				1.79	
Pottstown	88	30	56.9	2.38	
Quakertown	88[g]	24[g]	52.6[g]	2.29	
Reading[2]			53.6	5.93	
Reedsville	83	27	52.6	1.13	
Renovo *a*				1.09	
Renovo *b*	86	27	53.7	1.00	T.
Ridgway†				0.59	
Saegerstown	89	18	53.6	0.50	T.
St. Marys	84	25	51.4	0.97	T.
Salem Corners	82	28	52.6	1.51	T.
Scranton	87	25	53.5	1.10	T.
Seisholtzville				2.04	
Selinsgrove	86	27	53.4	1.89	
Shawmont				2.10	
Shinglehouse	86[g]	16	50.5[d]	0.82	T.
Sinnamahoning				1.04	
Smethport	85	21	50.4	0.65	T.
Smiths Corners				1.68	
Somerset	86	26	52.4	0.32	
South Bethlehem	88	33	56.6		
South Eaton	87	27	52.6	1.12	
State College	84	28	53.6	1.45	
Sunbury				2.00	
Swarthmore	85	31	56.2	2.15	
Swiftwater	80	25	51.8		
Towanda	87	24	51.8	1.17	
Uniontown *	81	32	54.3	0.22	
Warren†		25		0.13	
Wellsboro†	85	24	51.0	0.67	T.
West Chester	89	33	56.5	2.61	
West Newton†				0.05	
Westtown	87	29	55.0	2.42	
White Haven	84	24	51.6	1.75	
Wilkesbarre†	87	27	54.0	1.47	
Williamsport	86	30	53.5	1.68	
York†	88	28	55.0	2.60	
Rhode Island.					
Bristol	78	31	53.6	1.22	
Kingston	83	28	52.0	0.89	
Providence *a*	86	31	54.2	0.49	
South Carolina.					
Anderson†				4.17	
Batesburg†	87	45	65.8	5.05	
Blackville†	91	45	67.6	1.34	
Camden†				2.08	
Cheraw *a*†	90	38	64.0	1.50	
Cheraw *b*†				1.73	
Clemson College	91	37	64.8	4.23	
Conway†				2.64	
Darlington (near)				4.17	
Edisto†				1.28	
Effingham†				1.20	
Florence†	84	48	64.5	1.95	
Gaffney†				3.88	
Georgetown†	87	50	67.4	3.80	
Greenville†	89	42	63.7	3.94	
Greenwood	89	46	65.8	2.34	
Holland	92	35	63.1	4.35	
Kingstree *a*†	88	43	65.7	2.29	
Kingstree *b*				2.29	
Little Mountain[c]	96	45	67.0	1.75	
Longshore†	90	45	65.2	2.38	
Mount Carmel†				1.87	
Pinopolis *[1]	82	51	65.6	4.98	
Port Royal†	85	53	69.5	6.91	
St. Georges†	87	46	67.2	2.20	
St. Matthews†	90	46	66.4	1.96	
St. Stephens†				3.33	
Santuck†	89	38	65.4	2.21	
Shaws Fork *[1]	84	47	66.0	6.55	
Smiths Mills†				4.00	
Society Hill†	88	44	65.0	5.26	
Spartanburg	90	40	63.8	2.34	
Statesburg†	85	47	65.2	5.05	
Trenton	81[c]	51[c]	67.3[c]	2.18	
Trial†	90	45	66.3	2.15	
Walhalla	89	36	61.4	4.07	
Winnsboro	82	42	64.0	1.50	

TABLE II.—*Meteorological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
South Carolina—Cont'd.	°	°	°	Ins.	Ins.
Yemassee†	88	47	67.8	4.54	
Yorkville	92	43	66.0	2.31	
South Dakota.					
Aberdeen†	91	20	47.7	0.70	T.
Alexandria†	90	24	49.2	2.23	T.
Armour†[b]	89	28	53.8	2.83	
Ashcroft†	91	15	47.8	0.49	1.0
Brookings†	85	23	49.8	1.48	
Canton	90	25	53.8	1.17	
Castlewood†	86	16	47.1	1.56	T.
Centerville	......	......	......	1.40	
Chamberlain†	91	21	54.4	1.96	2.0
Clark	......	......	......	2.36	
Cross†	82	20	47.0	0.22	0.3
De Smet	87	20	49.0	1.97	2.0
Doland	90	18	49.4	2.43	1.6
Edgemont	......	......	......	0.04	
Eureka	94	18	47.3	0.74	T.
Farmingdale	......	......	......	0.27	......
Flandreau	94	21	51.0	0.91	
Forestburg†	92	22	51.0	2.11	1.0
Forest City	93	20	50.0	0.50	
Fort Meade†	88	28	51.4	0.02	T.
Gann Valley	91	19	50.0	1.90	2.5
Gary	90	23	49.4	1.27	
Goudyville	91	14	48.2	0.50	1.0
Greenwood	......	......	......	3.52	3.0
Highmore	90	22	50.4	1.16	2.0
Hotch City†	92	23	52.6	1.19	1.0
Hot Springs	83	28	48.8	0.64	
Howard†	91	20	50.2	2.21	
Ipswich	92	18	48.6	1.18	......
Kimball†	90	27	51.7	3.00	6.0
Leslie†	95	6	49.5	T.	
Mellette†	90	18	49.2	2.03	1.0
Menno†	92	29	54.2	1.49	
Millbank	91	17	49.4	0.82	
Mitchell†	91	22	52.8	1.93	
Nowlin	......	12	......	T.	
Oelrichs†	96	21	50.6		
Parker†	91	25	51.4	1.12	
Parkston†	91[h]	21[h]	53.1[h]	1.46	T.
Plankinton†	90	26[i]	51.8[e]	3.15	1.0
Rochford	78	11	44.4	0.51	0.5
Rosebud	90	23	50.1	0.50	4.0
Shiloh	90	14	49.4	0.01	
Silver City	......	......	......	0.05	
Sioux Falls†	90	22	51.1	1.41	
Spearfish†	84	23	51.4	0.77	2.0
Tyndall†	88	31	51.0	2.40	
Vermillion	93	30	54.3	......	
Watertown	86	16	47.2	1.87	
Wentworth†	87	20[c]	50.2	0.86	
Wessington Springs	85	26	47.8	1.60	5.0
Tennessee.					
Andersonville	89	32	61.5	1.05	
Arlington†	92	32	64.8	1.13	
Arthur†	......	......	......	0.63	
Ashwood*†[1]	90	37	66.9	0.60	
Benton (near)†	......	......	......	2.90	
Bluff City†	......	......	......	0.98	
Bolivar†	92	32	63.2	0.72	
Bristol†	84	33	58.6	1.25	
Brownsville†	92	31	67.4	1.80	
Byrdstown	86	31	62.1	1.33	
Carthage†	......	......	......	0.86	
Clarksville	91	36	65.0	1.57	
Clinton†	......	......	......	2.05	
Covington	93	35	66.8	0.40	
Decatur†	88	32	62.3	3.60	
Dyersburg	90	33	65.3	0.75	
Elizabethton†	89	33	61.6	1.19	
Elk Valley	86	33	61.6	0.93	
Erasmus	86	25	57.5	2.67	
Fairmount	......	......	......	3.77	
Florence†	89	37	64.8	1.04	
Franklin	89	32	63.8	0.78	
Greeneville†	89	32	60.9	1.70	
Harriman	86	33	61.4	4.20	
Hickory Withe	92	34	66.0	1.07	
Hohenwald†	......	......	......	1.10	
Jackson†	92	32	64.2	1.15	
Johnsonville†	90	30	63.1	1.75	
Jonesboro*[1]	82	35	57.6	1.70	
Kingston†	......	......	......	2.76	
Liberty†	89	35	64.5	1.13	
Lynnville†	94	36	65.0	1.03	
McKenzie†	92	34	65.4	0.85	
McMinnville†	87	34	62.8	2.00	
Milan†	92	35	70.0	1.06	
Molino†	90	36	67.2	2.13	
Newport†	88	33	61.4	1.98	
Nunnelly	90	28	62.2	1.05	
Oak Hill*[1]	87	30	61.7	1.10	
Palmetto†	89	37	66.4	0.98	
Peryear	92	32	64.4	1.40	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Tennessee—Cont'd.	°	°	°	Ins.	Ins.
Pope	96	32	66.0	1.04	
Riddleton†	87	33	63.0	0.97	
Rogersville†	88	33	61.4	1.00	
Rugby	86	27	58.8	1.88	
St. Joseph†	95	29	64.8	1.25	
Savannah	93	34	66.5	1.47	
Sewanee†	81	40	64.2	3.12	
Silver Lake	......	......	......	1.87	
Springdale*[1]	88	32	61.1	0.82	
Springfield	92	34	65.4	0.82	
Sylvia	97	35	68.5	1.52	
Tellico Plains†	89	35	63.0	2.16	
Tracy City	86	29	60.1	2.45	
Trenton	90	32	64.0	1.95	
Tullahoma†	89	30	62.2	3.20	
Union City†	92	34	63.9	0.10	
Waynesboro	91	30	64.0	1.40	
Wildersville	90	33	64.5	0.96	
Texas.					
Albany*[1]	87	34	67.0	0.45	
Arthur City†	......	......	......	1.82	
Austin *a*	88	46	71.4	7.92	
Austin *b**[3]	91	42	70.2	......	
Ballinger†	95	35	67.1	2.01	
Beeville†	97	48	74.8	2.66	
Blanco†	92[e]	48	72.3	7.00	
Boerne*[1]	87	42	70.5	2.33	
Brazoria†	93	50	73.0	10.23	
Brenham†	96	46	72.9	5.18	
Brighton†	93	54	75.2	2.14	
Brownwood	90	39	69.7	1.07	
Burnet*[1]	91	44	70.3	4.55	
Camp Eagle Pass†	102	48	75.2	0.00	
Childress	90	31	65.6	0.61	
Coleman	89	37	66.8	1.50	
College Station	91	44	72.2	5.07	
Colmesneil	......	......	......	3.78	
Columbia†	93	47	72.8	7.62	
Conroe	94	46	71.9	5.07	
Corsicana *b*†	97	42	70.9	4.52	
Cuero†	89	48	70.7	7.66	
Dallas†	92	38	67.7	3.06	
Danevang†	92	46	72.5	9.20	
Dublin†	89	37	66.8	4.50	
Duval*[1]	93	47	74.3	5.78	
Emory	96	45	69.4	2.74	
Estelle†	95	36	68.0	4.88	
Forestburg†	98	40	68.3	1.30	
Fort Brown	94	50	74.6	1.99	
Fort Clark	98	48	72.6	0.14	
Fort McIntosh	100	45	75.2	0.10	
Fort Ringgold†	97	54	77.0	0.63	
Fort Stockton	......	......	......	0.08	
Fredericksburg*†[1]	90[e]	41[d]	67.8[d]	3.37	
Fruitland	92	39	68.2	2.45	
Georgetown*[1]	91[d]	44	68.7[d]	4.10	
Golindo	......	......	......	3.70	
Grapevine†	95	40	69.4	2.26	
Hale Center†	82	30	62.8	0.80	
Hallettsville†	94	48	73.6	5.26	
Hearne†	95	46	72.6	1.90	
Henrietta†	94	37	68.4	2.60	
Hewitt	......	......	......	3.57	
Houston†	92	50	73.9	6.59	
Huntsville†	91	45	71.8	5.86	
Jacksonville	95	41	69.8	2.60	
Junction City	90	37	68.4	1.62	
Kent	......	......	......	1.02	
Kerrville	93	39	67.1	1.84	
Lampasas†	93	38	67.6	2.64	
Llano*†[5]	88	45	70.2	2.55	
Longview†	96	41	69.9	2.39	
Luling†	92	47	72.8	6.74	
Marshall	90[e]	42[e]	72.4[e]	2.48	
Menardville	98	35	67.4	1.67	
Midland	100	32	68.8	0.04	
Mount Blanco†	89	27	60.1	0.11	
New Braunfels†	91	47	71.4	1.72	
Orange†	87[h]	48	70.0[d]	2.59	
Panter	......	......	......	2.30	
Paris†	96	37	69.6	2.34	
Point Isabel*[1]	88	60	77.6	1.10	
Rheinland†	94	32	67.7	0.91	
Roby	92	30	66.7	0.75	
Rocksprings	......	......	......	0.60	
Runge†	99[j]	49[j]	75.5[j]	4.90	
San Antonio	94	47	74.0	1.43	
Sanderson†	88	38	64.5	0.16	
San Marcos *b*†	91	46	70.5	5.03	
Sulphur Springs†	99	40	71.4	2.40	
Temple *a*	91	42	70.2	2.84	
Temple *b*[1]	90	57	74.4	0.40	
Tyler	91	40	68.7	1.50	
Valentine†	98	30	61.0	0.50	
Victoria	......	......	......	7.50	
Waco†	92	43	72.2	2.48	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Texas—Cont'd.	°	°	°	Ins.	Ins.
Waxahachie†	......	39	......	3.35	
Weatherford†	89	39	67.8	3.12	
Wichita Falls†	......	......	......	1.75	
Utah.					
Alpine City†	......	......	......	1.86	
Blue Creek*[8]	70	30	48.2	......	
Brigham City†	......	......	......	2.79	
Cisco†[f]	86	23	53.9	3.04	
Corinne	74	24	48.0	1.49	T.
Ferron	79	26	50.2	1.11	1.0
Fillmore†	84	15	50.0	3.58	
Fort Duchesne†	75	19	48.2	3.00	
Frisco	70	23	46.8	1.50	0.5
Giles†	80	23	53.4	3.20	
Heber	74	12	44.2	1.50	T.
Huntsville	......	......	......	1.38	
Kelton*[5]	80	30	50.2	0.10	T.
Levan†	72	17	46.8	3.29	
Loa†	73	7	40.6	1.83	6.5
Logan†	75	26	47.9	2.62	
Millville	......	......		2.66	
Minersville	71	21	48.4	1.57	
Moab†	75	29	52.4	2.52	T.
Mount Pleasant†	85	20	48.8	2.30	
Ogden *a**[5]	74	30	50.7	1.93	......
Ogden *b*	74	26	52.1	2.13	T.
Pahreah	78	24	50.9	1.10	
Park City†	68	10	43.0	0.28	
Parowan†	75	19	46.5	2.48	14.6
Pinto	70	17	43.6	3.76	16.0
Promontory	80	18	46.0	2.36	0.5
Richfield†	70	22	43.8	1.59	
St. George†	85	24	57.0	1.21	
Scipio†	73	13	46.2	3.34	T.
Snowville	74	22	46.8	3.30	
Soldier Summit†	85	10	40.5	0.65	1.5
Terrace*[8]	82	34	57.8	......	......
Tooele†	75[k]	26	45.6[f]	2.92	......
Tropic	76[f]	23[f]	48.8[f]	1.50	
Vernal	......	......	......	2.34	
Vermont.					
Brattleboro	88	22	49.7	1.48	
Burlington†	76	29	52.2	1.53	
Chelsea†	77	20	46.4	0.89	
Cornwall	80	23	51.0	1.58	
Enosburg Falls	82	22	48.4	0.82	
Hartland†	82	16	45.7	1.38	
Jacksonville	80	17	45.6	1.56	
St. Johnsbury	78	18	45.7	1.17	
Strafford*†[1]	76	24	48.0	1.00	
Vernon*[6]	86	21	49.3	1.75	
Wells	80	20	48.8	1.28	
Virginia.					
Alexandria	87	35	57.3	3.39	
Ashland†	88	35	58.8	6.93	
Barboursville	84	34	57.1	4.56	
Bedford City	91	35	61.6	3.63	
Bigstone Gap†	85	26	57.6	0.60	
Birdsnest*†[1]	91	41	63.4	7.10	
Blacksburg	86	27	55.6	3.54	
Buckingham†	97	32	57.9	4.72	
Burkes Garden	......	......	......	1.44	
Callaville†	85	35	60.4	5.09	
Christiansburg†	......	......	......	3.88	
Clarksville	......	......	......	1.15	
Clifton Forge	86	30	56.5	2.87	
Dale Enterprise†	89	26	54.7	2.55	
Doswell	89	31	57.8	5.60	
Farmville	88	34	58.7	4.83	
Fredericksburg†	88	35	58.6	5.25	
Gordonsville	78	33	55.8	......	
Goshen	......	......	......	1.50	
Grahams Forge	82	26	55.2	3.41	
Guinea	......	......	......	5.65	
Hampton	84	44	63.8	7.84	
Hot Springs	85	33	55.8	2.11	
Leesburg	87	28	55.9	1.75	
Lexington†	88	31	58.4	2.56	
Maidens	......	......	......	8.81	
Manassas†	90	31	58.4	2.42	
Marion†	83[g]	28[g]	57.5[g]	1.50	
Nottoway	96	34	61.4	6.05	
Petersburg†	91	35	62.3	4.88	
Quantico	79	31	57.1	......	
Richmond (near)†	90	34	60.2	6.62	
Rockymount†	86	35	60.7	3.75	
Salem†	88	38	62.4	4.17	
Speers Ferry	......	......	......	0.93	
Spottsville†	87	35	62.5	9.64	
Stanardsville†	90	32	58.1	3.81	
Staunton†	90	32	58.4	2.84	
Stephens City†	92	31	58.6	2.05	
Sunbeam†	84	39	60.6	7.30	
Swords Creek	84	31	58.2	0.34	
Warrenton	86	41	58.9	3.85	
Warsaw†	87	34	59.6	6.41	

TABLE II.—*Meteorological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Virginia—Cont'd.	°	°	°	*Ins.*	*Ins.*
Westbrook Farm	88	37	60.4	......	
Woodstock†	92	30	56.9	2.94	
Wytheville†	86	33	58.4	2.08	
Washington.					
Aberdeen	75	34	52.4	4.27	
Anacortes	......	......	......	2.37	
Ashford†	......	......	......	3.76	
Blaine†	65	22	45.4	1.60	
Centerville†	90	19	50.0	0.49	
Chehalis†	76	33	52.0	2.12	
Clearwater	......	34	......	7.40	
Colfax†	77	21	47.4	0.61	
Coupeville†	63	36	49.0	1.80	
Dayton	77	25	51.2	0.07	
Ellensburg	75	23	46.6	0.47	
Ellensburg (near)	80	24	48.2	0.27	T.
Fort Simcoe†	85	31	53.8	1.39	
Fort Spokane	75	20	43.9	0.42	
Grandmound†	70	31	49.8	1.91	
Hunters†	74	20	41.8	0.35	
Kennewick†	81	25	53.4	0.12	
La Center	80	32	52.0	3.16	
Lakeside	76	31	50.4	0.74	
Lapush	63	37	51.2	4.55	
Lind	85	19	51.6	0.28	
Loomis†	76d	27d	47.8d	0.62	
Madrone†	66	34	49.4	1.59	
Mayfield†	72	31	50.2	2.66	
Moxee Valley†	82	21	48.6	0.47	
New Whatcom	71	32	51.2	1.31	
Olga	65	35	48.4	1.15	
Olympia†	70	32	50.7	1.55	
Pinehill†	78	29	50.8	0.57	
Pomeroy	73	34	54.0	0.30	
Port Townsend	69	39	51.4	1.27	
Pullman†	86	25	48.4	0.74	
Rosalia†	79	20	47.6	0.24	
Sedro†	72	33	52.2	2.24	
Shoalwater Bay*[10]	74	42	55.5	......	
Snohomish†	67	39	52.6	3.42	
Southbend	81	35	53.2	3.43	
Stampede	75	29	47.8	3.16	4.0
Stillaguamish	65	29	48.5	2.60	
Sunnyside†	81	23	49.4	0.11	
Union City†	68	32	50.2	2.25	
Vashon†	64	35	50.3	1.78	
Waterville†	76	21	46.0	0.96	
West Virginia.					
Beverly†	95	24	59.0	0.52	
Bluefield†	83	32	58.7	0.65	
Buckhannon *a*†	......	......	......	0.25	
Buckhannon *b*	83	25	55.4	......	
Burlington†	89	25	55.2	0.85	
Charleston†	......	......	......	0.07	
Dayton†	85	28	56.2	0.31	
Eastbank	91	32	61.8	0.15	
Elkhorn†	84	32	59.7	0.53	
Fairmont†	......	......	......	0.12	
Glenville†	85	28	56.0	0.15	
Grafton†	91	26	58.8	0.32	
Green Sulphur	87	30	56.7	0.29	
Harpers Ferry†	......	......	......	2.27	
Hinton *a*†	......	......	......	0.76	
Hinton *b*†	85	30	59.4	......	
Huntington	84	30	58.7	0.12	
Kingwood	81	26	55.4	0.62	
Marlinton†	83	22	53.8	0.95	
Martinsburg†	90	31	56.9	1.15	
Morgantown *b*†	94	25	59.4	0.29	
New Martinsville†	91	27	59.8	0.18	
Nuttallburg†	95	32	60.6	......	
Oldfields†	89	27	55.6	1.16	
Philippi†	85	......	......	1.50	
Point Pleasant†	90	30	60.8	0.40	
Powellton	84	32	58.3	0.10	
Romney	86	29	56.9	0.90	
Rowlesburg†	......	......	......	0.65	
Upper Tract	97	33	63.4	0.93	
Weston *a*	......	......	......	0.10	
Weston *b**†[1]	88	28	56.2	......	
Wheeling *a*†	......	......	......	0.07	
Wheeling *b*†	85	32	58.1	0.07	
Wisconsin.					
Amherst	86	23	51.0	0.61	
Antigo	84	21	50.0	2.01	T.
Barron	79	19	47.6	1.85	
Bayfield	78	29	49.3	1.67	T.
Beloit	86	31	55.5	0.65	
Butternut	85	21	49.5	2.01	T.
Chilton	85	28	54.6	1.65	
Citypoint	87	25	54.6	0.55	
Crandon	......	......	......	3.93	3.0
Delavan	89	22	54.4	0.95	
Dodgeville†	86	25	52.4	1.24	
Eau Claire	86	24	52.5	2.49	
Florence†	80	20	47.2	3.28	2.2
Wisconsin—Cont'd.	°	°	°	*Ins.*	*Ins.*
Fond du Lac	85	29	53.9	2.05	
Grand River Locks	......	......	......	2.04	
Grantsburg†	78	21	50.0	1.70	
Gratiot	95	24	54.5	0.30	
Hartford[c]	82	25	48.8	1.10	
Hartland	88	27	54.6	1.13	
Harvey	90	29	42.6	0.88	
Hayward	79	21	48.6	3.06	1.0
Hillsboro	87	20	51.8	0.48	
Kenosha*[10]	88	38	58.3	......	
Koepenick*†[1]	82	30	51.9	3.00	
Lancaster†	86	24	53.6	1.14	
Lincoln†	85	30	53.0	2.21	
Madison†	84	33	55.4	0.86	
Manitowoc†	83	31	53.0	2.30	
Meadow Valley†	89	21	52.1	0.74	
Medford†	87	18	49.6	2.45	
Menasha	......	......	......	1.93	
Neillsville†	82	22	50.8	1.12	
New Holstein	88	29	57.0	1.00	
New London	82	27	51.8	1.07	
Oconto	84	26	51.5	1.61	T.
Osceola†	83	19	50.2	2.11	
Pepin	89	23	53.2	1.22	
Pine River†	86	26	52.8	1.06	T.
Portage†	85	27	51.9	2.04	
Port Washington	87	29	54.8	1.34	
Prairie du Chien	89	26d	57.7	0.42	
Racine	88	31	57.1	0.56	
Sharon	88f	24f	52.6f	0.79	
Shawano	84	24	50.0	1.06	
Spooner†	88	21	49.8	2.08	1.0
Stevens Point†	94	24	51.6	0.60	
Sturgeon Bay Canal*[10]	72	30	51.2	......	
Two Rivers*[10]	74	32	53.4	......	
Valley Junction†	87	19	52.6	0.41	
Viroqua	86	26	54.8	0.27	
Watertown†	87	27	53.6	1.24	
Waukesha†	86	33	55.2	1.11	
Waupaca†	85	26	52.4	0.69	
Wausau†	81	26	49.6	1.92	
Wausaukee	87	15	48.4	2.26	0.2
Westbend	84	30	52.4	0.96	
Westfield†	84	27	52.8	0.59	
Whitehall	87	21	51.4	0.95	
White Mound†	89	22	54.9	2.08	
Wyoming.					
Atlantic City	69	−6	36.4	......	......
Big Horn Ranch	75	6	43.6	1.94	18.0
Carbon	78	17	46.5	1.25	8.0
Fort Laramie†	85	24	50.9	1.02	T.
Fort Washakie	76	10	43.8	1.00	7.9
Fort Yellowstone†	72	14	40.9	1.72	6.5
Laramie	73	5	42.4	0.55	5.0
Lowell	78	11	45.5	1.18	3.6
Lusk†	82	22	46.0	0.21	T.
Sheridan	82	16	46.7	0.99	3.0
Sundance	83	15	45.4	0.72	7.0
Wamsutter	69	28	47.3	0.40	4.0
Wheatland	82	25	52.4	0.30	1.0
Mexico.					
Ciudad P. Diaz	91	52	78.5	0.08	
Leon de Aldamas	82	44	65.2	0.38	
Topolobampo*[1]	93	62	80.8	0.43	
New Brunswick.					
St. John	68	29	46.6	0.99	
West Indies.					
Grand Turk Island	......	......	......	2.32	
Minnesota.	°	°	°	*Ins.*	*Ins.*
Glenwood	91	32	65.6	4.00	
Mississippi.					
Edwards[1]	97	50	80.6	0.47	
Thornton	96	46	78.3	1.15	
Missouri.					
Bolckow	......	......	......	0.83	
Montana.					
Dupuyer	88	26	54.5	1.02	0.2
Nevada.					
Wells	......	......	......	0.00	
New Jersey.					
Beachhaven	95	45	68.6	0.65	
New Mexico.					
Alma	89	48	67.5	4.15	
Bluewater	89	40	61.2	3.00	
Hillsboro	87	51	67.7	5.38	
Lordsburg*[8]	89	63	74.4	......	
Raton	86	38	58.9	0.11	
Shattucks Ranch	87	38	61.5	4.66	
Winsors Ranch	80	27	52.4	3.77	
New York.					
Potsdam	89	29	57.4	1.31	
Wappingers Falls	89	35	61.8	1.88	
Oregon.					
Coquille River L. H	....	......	......	1.46	
Tillamook Rock L. H	......	......	......	3.13	
South Dakota.					
Nowlin	......	37	......	0.00	
Tennessee.					
Erasmus	90	30	65.0	......	
Utah.					
Thistle	88	18	53.2	2.19	
Wyoming.					
Atlantic City	82	28	54.2	......	
Wamsutter	82	44	63.9	T.	

Late reports for September, 1897.

Stations.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Alaska.					
Coal Harbor	67	35	49.6	3.76	
Arizona.					
Arizona Canal Co. Dam.	102	61	80.8	2.02	
Dragoon	......	......	......	3.10	
California.					
Keeler*[8]	106	64	79.9	0.14	
Ukiah	......	......	......	0.10	
Georgia.					
Piscola	......	......	......	4.50	
Iowa.					
Iowa City *a*	100	33	71.0	3.54	
Kansas.					
Wellington*[1]	94	52	75.7	T.	
Louisiana.					
Grand Coteau	91	51	75.9	2.06	
Jennings	96	55	77.2	2.12	
Lake Providence	97	49	78.2	T.	
Opelousas	96	45	77.0	1.48	
Michigan.					
Bois Blanc*[10]	92	39	61.1	......	

EXPLANATION OF SIGNS.

* Extremes of temperature from observed readings of dry thermometer.

† Weather Bureau instruments.

‡ Record furnished by the Arrowhead Reservoir Company, in the San Bernardino Mountains, San Bernardino County, Cal., at elevations varying from 5,150 to 5,350 feet.

A numeral following the name of a station indicates the hours of observation from which the mean temperature was obtained, thus:

[1] Mean of 7 a. m + 2 p. m. + 9 p. m. + 9 p. m. ÷ 4.
[2] Mean of 8 a. m. + 8 p. m. ÷ 2.
[3] Mean of 7 a. m. + 7 p. m. ÷ 2.
[4] Mean of 6 a. m. + 6 p. m. ÷ 2.
[5] Mean of 7 a. m. + 2 p. m. ÷ 2.
[6] Mean of readings at various hours reduced to true daily mean by special tables.
[7] Mean from hourly readings of thermograph.
[8] Mean of 7 a. m. + 2 p. m. + 9 p. m. ÷ 3.
[9] Mean of sunrise and noon.
[10] Mean of sunrise, noon, sunset, and midnight.

The absence of a numeral indicates that the mean temperature has been obtained from daily readings of the maximum and minimum thermometers.

An italic letter following the name of a station, as "Livingston *a*," "Livingston *b*," indicates that two or more observers, as the case may be, are reporting from the same station. A small roman letter following the name of a station, or in figure columns, indicates the number of days missing from the record; for instance, "n" denotes 14 days missing.

No note is made of breaks in the continuity of temperature records when the same do not exceed two days. All known breaks, of whatever duration, in the precipitation record receive appropriate notice.

CORRECTIONS.

Kansas, Hays, June, 1897, make maximum, minimum, and mean temperature read 100, 48, and 74.8 instead of 95, 45, and 68.6.

August Review, page 342, second column, lines 36, 37, for 8th, 16th, 74, read 7th, 15th, 77.

Page 399, first column, line 16 from bottom, for "7 inches deep," read "seven deep."

Florida, Huntington, September, 1897, make maximum and mean temperature read 89 and 76.2.

Oklahoma, September, 1897, make Pondcreek read Jefferson

Wisconsin, Waukesha, September, 1897, make mean temperature read 67.2 instead of 67.0.

NOTE.—The following change has been made in names of stations: Wyoming, Strong changed to Lowell.

TABLE III.—*Data from Canadian stations for the month of October, 1897.*

Stations.	Pressure. Mean not reduced.	Pressure. Mean reduced.	Pressure. Departure from normal.	Temperature. Mean.	Temperature. Departure from normal.	Precipitation. Total.	Precipitation. Departure from normal.	Prevailing direction of wind.	Total depth of snow.
	Inches.	*Inches.*	*Inches.*	°	°	*Inches*	*Inches.*		
St. Johns, N. F	29.70	29.85	— .09	42.6	— 2.8	4.49	....	ne.	
Sydney, C. B. I	30.01	30.07	+ .11	45.2	— 1.3	2.21	— 2.09	nw.	
Grindstone, G. St. L.	....	....	....	....	....	....	....	....	
Halifax, N. S	30.01	30.14	+ .16	46.4	— 0.8	0.75	— 4.64	w.	
Grand Manan, N. B.	30.06	30.11	+ .17	48.0	+ 1.1	0.40	— 4.28	w.	
Yarmouth, N. S.	30.07	30.15	+ .17	46.2	— 1.4	0.78	— 3.25	s.	
Charlottet'n, P. E. I.	30.04	30.08	+ .16	45.6	— 0.9	1.84	— 2.64	nw.	T.
Chatham, N. B	30.04	30.06	+ .10	43.6	+ 0.6	0.96	— 2.93	w.	T.
Father Point, Que.	30.01	30.04	+ .08	41.8	+ 2.0	1.76	— 0.86	w.	T.
Quebec, Que	29.77	30.11	+ .12	43.4	+ 1.0	1.25	— 2.40	sw.	
Montreal, Que	29.91	30.12	+ .12	46.2	+ 1.4	0.65	— 2.96	sw.	
Rockliffe, Ont.	29.58	30 10	+ .08	43.0	+ 1.5	1.86	— 0.84	se.	
Kingston, Ont	29.80	30.12	+ .09	49.1	+ 2.1	1.09	— 1.91	ne.	
Toronto, Ont	29.74	30.12	+ .08	49.0	+ 2.4	1.44	— 0.85	n.	T.
White River, Ont	28.69	40.06	+ .04	38.9	+ 1.8	1.43	— 1.02	s.	3.4
Port Stanley, Ont	29.46	30.10	+ .07	49.1	+ 1.3	1.09	— 2.19	e.	
Saugeen, Ont	29.38	30.10	+ .10	47.6	+ 1.5	2.52	— 1.29	se.	0.7
Parry Sound, Ont.	29.40	30.10	+ .09	46.2	+ 2.3	4.17	— 0.15	e.	
Port Arthur, Ont	29.30	30.01	+ .01	42.8	+ 2.9	1.44	— 1.25	w.	
Winnipeg, Man	29.11	29.95	— .04	41.0	+ 1.9	1.33	— 0.40	nw.	0.2
Minnedosa, Man	28.13	29.95	— .02	39.6	+ 1.8	1.01	— 0.55	nw.	0.6
Qu'Appelle, Assin.	27.66	29.95	— .02	38.2	— 1.2	0.69	— 0.33	s.	4.5
Medicine Hat, Assin	27.63	29.95	— .01	41.8	— 3.0	1.26	— 0.82	w.	3.0
Swift Curr't, Assin.	27.38	29.99	.00	39.5	— 2.6	0.88	— 0.35	w.	0.1
Calgary, Alberta	26.36	29.93	— .03	39.6	— 0.5	0.76	+ 0.40	w.	3.3
Prince Albert, Sask.	28.34	29.87	....	37.3	+ 0.2	0.58	....	sw.	1.2
Edmonton, Alberta.	27.56	29.92	— .02	41.6	+ 0.5	0.27	— 0.30	nw.	1.0
Battleford, Sask	28.16	29.91	....	40.2	+ 0.6	0.19	....	w.	0.6
Kamloops, B. C.	28.60	29.84	....	47.5	....	0.41	....	se.	
Hamilton, Bermuda	29.88	20.04	+ .02	74.0	+ 1.0	7.52	....	ne.	
Banff, Alberta.	25.34	30.02	....	37.6	....	1.31	....	sw.	7.0
Esquimalt, B. C.	30.01	30.04	....	47.4	— 1.0	1.26	....	n.	
Ottawa, Ont	29.79	30.16	....	44.0	+ 0.2	0.69	....	e.	

TABLE IV.—*Meteorological observations at Honolulu, Republic of Hawaii, by Curtis J. Lyons, Meteorologist to the Government Survey.*

Pressure is corrected for temperature and reduced to sea level, but the gravity correction, —0.06, is still to be applied.

The average direction and force of the wind and the average cloudiness for the whole day are given unless they have varied more than usual, in which case the extremes are given. The scale of wind force is 0 to 10. Two directions of wind, connected by a dash, indicate change from one to the other; also same for force.

The rainfall for twenty-four hours is given as measured at 6 a. m. on the respective dates.

October, 1897.	Pressure at sea level. 6 a. m.	Pressure at sea level. 3 p. m.	Pressure at sea level. 9 p. m.	Temperature. 6 a. m.	Temperature. 2 p. m.	Temperature. 9 p. m.	Temperature. Maximum.	Temperature. Minimum.	Relative humidity. 6 a. m.	Relative humidity. 2 p. m.	Relative humidity. 9 p. m.	Wind. Direction.	Wind. Force.	Cloudiness.	Rain measured at 6 a. m.
	Ins.	*Ins.*	*Ins.*	°	°	°	°	°	%	%	%				*Ins.*
1 ...	30.09	30.07	30.13	75	79	76	83	73	74	75	74	ene.	3	7	0.04
2 ...	30.08	30.03	30.08	76	80	76	84	74	70	68	70	ene.	3	7	0.03
3 ...	30.05	30.00	30.06	73	82	74	85	71	78	65	82	ene.	2	3	0.00
4 ...	30.03	29.95	30.03	70	83	74	87	68	86	55	74	ne.	1	3	0.00
5 ...	29.97	29.91	29.97	69	79	71	86	67	86	71	91	sw.	1	3-10	0.00
6 ...	29.98	29.94	29.99	73	80	76	82	69	78	68	70	sw.	1	9-4	0.05
7 ...	30.03	30.00	30.06	72	82	77	86	67	82	65	74	e.	1	3	0.00
8 ...	30.05	30.00	30.07	74	83	77	86	72	74	69	78	ene.	2	3	0.00
9 ...	30.06	30.00	30.05	74	83	75	86	72	87	69	91	ese.	2	8	0.00
10 ...	30.00	30.00	29.97	73	81	74	84	70	82	72	91	s.	1	7	0.05
11 ...	29.95	29.95	30.02	73	80	75	84	70	91	72	91	sw.	1	8	0.04
12 ...	30.05	29.92	30.14	74	80	76	81	70	86	72	74	ne.	1	9	0.33
13 ...	30.13	30.05	30.12	74	79	76	82	75	82	68	70	ene.	2	8	0.03
14 ...	30.10	30.07	30.06	75	79	75	81	74	66	64	70	ne.	3	6	0.03
15 ...	30.07	30.02	30.06	74	79	76	80	72	82	64	66	ne.	3	6	0.02
16 ...	30.05	30.01	30.03	74	80	76	82	70	74	55	66	ene.	2	6	0.01
17 ...	30.01	29.99	30.03	69	80	73	82	66	76	64	78	ene.	2	5	0.34
18 ...	30.04	29.99	30.05	72	79	75	81	67	91	68	74	ne.	2	8	0.17
19 ...	30.05	29.97	30.05	76	81	72	85	73	74	61	86	ne.	2	5	0.01
20 ...	30.05	29.96	30.09	76	80	77	81	69	74	68	71	ene.	2	5	0.01
21 ...	30.06	29.98	30.09	74	81	76	83	73	70	61	74	ene.	3	6	0.01
22 ...	30.06	29.90	30.08	75	80	78	82	75	74	64	91	ne.	4	6	0.01
23 ...	30.05	30.00	30.05	74	80	76	81	72	82	68	78	ene.	3	5	0.07
24 ...	30.03	29.98	30.04	71	79	76	83	68	82	71	91	s.	1	6	0.01
25 ...	30.02	29.97	30.00	72	78	76	82	69	91	83	91	s.	1	10	0.09
26 ...	29.98	29.92	29.99	74	79	76	82	71	91	79	82	sw.	2	8	0.08
27 ...	29.98	29.98	30.04	72	79	72	80	70	91	79	91	sw.	1	8	0.00
28 ...	30.03	30.00	30.07	72	80	74	84	69	91	79	91	e.	1	6	0.34
29 ...	30.03	30.02	30.08	72	79	72	84	70	86	71	86	ene.	1	9	0.04
30 ...	30.04	30.00	30.06	72	82	76	84	70	78	58	74	ene.	1	6	0.00
31 ...	30.04	30.00	30.06	73	80	74	82	72	82	61	74	ene.	1	2	0.00
	30.04	29.99	30.05	73.1	80.2	75.1	83.1	72.5	83.1	65.6	79.5	ene.	1.8	6.0	1.81

Mean temperature: 6+2+9÷3 is 76.1°; extreme temperatures 87° and 66°.

TABLE V.—*Mean temperature for each hour of seventy-fifth meridian time, October, 1897.*

Stations.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Midnight.	Mean.
Bismarck, N Dak	43.9	43.0	41.8	41.1	40.0	39.0	38.5	38.0	38.4	41.4	45.4	49.4	51.9	53.9	55.7	56.5	57.0	56.4	53.6	50.4	48.1	46.4	45.2	43.7	46.6
Boston, Mass	51.1	50.3	49.8	49.2	48.8	48.7	49.0	51.0	53.1	55.2	57.2	59.2	60.2	60.8	60.7	59.9	58.4	57.3	55.7	54.5	53.8	53.0	52.0	51.0	54.2
Buffalo N Y	52.6	51.8	51.3	50.8	50.4	50.1	50.3	51.0	53.3	55.1	56.6	58.0	58.8	59.8	60.5	60.5	59.3	57.6	55.9	55.5	54.1	53.6	53.5	52.8	54.7
Chicago, Ill	57.7	57.0	56.3	55.5	54.9	54.1	53.8	54.6	55.7	57.1	58.8	59.5	60.9	61.5	62.1	62.6	62.7	62.1	61.3	60.6	59.9	59.1	58.5	58.0	58.5
Cincinnati, Ohio	59.1	57.8	56.7	55.3	54.3	53.1	52.1	52.9	54.4	58.4	62.5	66.2	68.7	70.7	72.2	72.7	72.9	71.9	70.1	67.5	65.9	63.7	62.1	60.0	62.6
Cleveland, Ohio	54.3	53.4	52.9	52.1	51.5	51.1	50.9	51.3	53.2	55.9	58.8	60.8	62.0	62.4	62.9	62.9	62.7	62.2	61.0	59.5	58.4	57.5	56.1	55.2	57.0
Detroit, Mich	53.1	52.5	51.8	51.5	50.8	50.5	50.1	50.6	52.4	54.8	57.3	59.5	61.3	62.3	63.2	63.2	61.7	60.6	58.5	56.9	55.6	54.7	53.9	53.3	55.8
Dodge City, Kans	55.2	53.7	52.4	51.4	50.5	49.6	48.7	47.8	49.2	54.3	59.1	62.8	66.1	68.4	69.8	71.0	71.0	69.9	67.2	62.2	60.1	58.2	56.6	55.7	58.8
Eastport, Me	45.3	44.8	44.4	44.0	43.7	43.5	43.8	45.1	47.3	49.0	51.1	52.3	53.1	53.2	53.0	52.0	50.4	49.2	48.1	47.3	46.6	46.1	45.7	45.4	47.7
Galveston, Tex	74.8	74.6	74.5	74.1	73.9	73.4	73.2	72.8	73.5	74.6	76.2	77.4	78.1	78.7	78.7	78.8	78.4	77.8	77.0	76.3	76.1	75.9	75.2	74.6	75.8
Havre, Mont	41.9	40.0	39.2	39.1	37.7	36.8	36.1	35.9	34.3	35.5	40.1	45.0	49.0	52.2	55.4	57.3	58.5	58.7	57.0	52.7	48.8	46.5	44.6	43.1	45.2
Kansas City, Mo	61.4	60.2	59.2	58.1	57.1	55.5	54.5	54.2	55.9	59.2	63.3	67.1	69.5	71.7	73.0	73.8	73.5	72.2	69.9	67.5	65.4	63.8	62.6	61.3	63.8
Key West, Fla	77.3	77.1	77.1	77.0	76.8	76.7	77.1	78.1	79.2	79.8	80.7	80.8	80.9	81.1	80.5	80.5	79.6	79.1	78.3	78.3	78.2	78.0	77.9	77.7	78.7
Memphis, Tenn	67.1	65.8	64.3	63.3	62.1	61.3	60.5	60.5	61.9	65.2	70.2	73.4	76.0	77.3	78.7	79.4	78.8	77.7	75.0	73.7	71.7	70.3	68.7	67.2	69.6
New Orleans, La	69.8	69.5	69.4	69.0	68.5	68.2	67.9	68.8	71.3	73.9	76.5	77.9	79.2	79.2	79.4	79.3	78.7	77.3	75.5	74.2	72.7	71.7	70.9	70.1	73.3
New York, N. Y	53.8	53.2	52.4	52.1	51.5	51.1	51.7	52.3	53.1	54.9	57.0	58.7	59.8	60.7	60.9	60.9	59.8	58.4	57.2	56.8	56.0	55.3	54.6	53.9	55.7
Philadelphia, Pa	54.6	53.7	53.1	52.7	52.0	51.6	51.7	53.5	55.4	57.4	59.9	61.8	63.3	64.4	65.0	65.0	63.8	61.9	59.9	58.7	57.4	56.5	55.7	55.2	57.7
Pittsburg, Pa	55.1	53.8	52.6	51.7	50.8	50.4	49.7	50.9	53.5	57.4	60.8	64.2	66.7	68.2	68.6	68.7	68.1	66.4	64.7	63.0	61.2	59.5	57.9	56.5	59.2
Portland, Oreg	52.5	51.7	51.0	50.4	49.7	49.2	48.4	48.3	47.6	47.5	47.8	49.8	51.9	54.1	56.7	58.7	60.1	60.6	61.1	59.7	58.0	56.7	55.4	53.9	53.4
St. Louis, Mo	62.9	61.4	59.9	58.9	58.1	57.2	56.3	56.9	58.8	62.1	66.2	70.3	73.1	74.8	76.5	76.7	76.0	74.5	72.4	70.6	68.4	66.6	64.7	63.2	66.1
St. Paul, Minn	50.6	49.9	49.2	48.5	48.1	47.4	46.6	46.6	46.8	48.9	51.4	53.7	56.4	58.2	59.6	60.5	60.2	59.0	56.8	55.3	53.5	52.3	51.3	50.7	52.6
Salt Lake City, Utah	48.7	48.0	47.4	46.5	46.1	45.8	45.4	45.8	44.5	45.4	47.4	50.6	53.6	54.7	56.1	57.3	58.1	57.4	57.0	54.8	52.7	51.1	49.9	48.6	50.5
San Diego, Cal	60.3	59.9	59.5	59.1	58.5	58.1	57.5	57.5	57.1	58.2	60.8	63.9	66.0	66.8	67.9	67.9	67.6	67.1	66.3	65.1	63.7	62.8	62.1	61.1	62.3
San Francisco, Cal	56.2	56.1	55.7	55.5	55.3	55.1	54.7	54.6	54.6	54.4	55.4	56.7	58.5	60.0	61.6	62.6	62.8	62.3	61.1	59.5	58.3	57.5	56.8	56.7	57.6
Savannah, Ga	65.1	64.4	63.7	63.3	62.9	62.5	62.4	64.0	66.5	69.3	71.9	73.7	74.5	75.5	75.6	75.3	73.7	71.2	69.6	68.9	67.9	67.1	66.5	65.8	68.4
Washington, D. C	53.3	52.6	52.1	52.2	51.7	51.0	51.0	53.1	55.9	58.4	61.1	63.0	64.7	65.8	66.0	65.6	64.3	62.4	59.7	58.2	57.0	55.9	55.1	54.1	57.7

TABLE VI.—*Mean pressure for each hour of seventy-fifth meridian time, October, 1897.*

Stations.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Midnight.	Mean.
Bismarck, N. Dak	28.226	.226	.228	.228	.228	.230	.233	.235	.239	.245	.245	.241	.234	.221	.211	.202	.200	.200	.205	.211	.215	.220	.223	.226	.224
Boston, Mass	30.010	.005	.005	.005	.011	.019	.029	.036	.036	.031	.024	.009	.997	.990	.985	.988	.994	.001	.012	.015	.018	.015	.016	.015	.011
Buffalo, N. Y	29.278	.278	.276	.276	.282	.290	.297	.304	.314	.313	.308	.298	.285	.272	.266	.260	.260	.260	.265	.267	.269	.268	.270	.269	.280
Chicago, Ill.	29.194	.194	.195	.195	.201	.206	.218	.225	.230	.229	.226	.218	.203	.186	.172	.166	.165	.166	.168	.170	.176	.183	.183	.179	.194
Cincinnati, Ohio	29.427	.429	.428	.431	.437	.447	.457	.465	.473	.475	.471	.459	.439	.418	.407	.399	.395	.397	.402	.407	.412	.418	.419	.415	.430
Cleveland, Ohio	29.277	.279	.276	.277	.283	.288	.299	.306	.315	.315	.312	.302	.281	.266	.258	.253	.250	.253	.256	.256	.263	.266	.267	.266	.278
Detroit, Mich	29.310	.312	.308	.309	.316	.322	.330	.340	.348	.346	.339	.330	.310	.296	.288	.286	.286	.287	.293	.298	.305	.307	.303	.299	.311
Dodge City, Kans	27.436	.437	.437	.439	.435	.436	.442	.446	.456	.464	.467	.464	.450	.432	.408	.397	.393	.392	.397	.407	.415	.425	.431	.433	.431
Eastport, Me	30.016	.014	.013	.015	.017	.025	.034	.041	.041	.037	.026	.016	.005	.999	.998	.998	.006	.013	.023	.026	.029	.027	.027	.026	.020
Galveston, Tex	29.974	.970	.963	.958	.955	.962	.971	.978	.988	.997	.003	.998	.983	.966	.950	.942	.936	.937	.943	.950	.961	.970	.975	.972	.967
Havre, Mont	27.329	.334	.337	.341	.342	.340	.345	.347	.354	.361	.363	.362	.355	.342	.328	.316	.309	.308	.307	.311	.317	.323	.330	.334	.335
Kansas City, Mo	29.042	.041	.044	.045	.050	.055	.062	.071	.084	.089	.087	.081	.063	.038	.022	.011	.006	.006	.013	.017	.025	.030	.035	.034	.044
Key West, Fla	29.947	.939	.934	.931	.935	.944	.959	.972	.982	.985	.980	.965	.945	.930	.918	.910	.914	.924	.936	.948	.959	.964	.961	.954	.947
Memphis, Tenn	29.648	.648	.646	.645	.645	.653	.664	.674	.686	.694	.697	.693	.674	.653	.630	.618	.611	.611	.614	.619	.626	.631	.635	.633	.648
New Orleans, La	29.985	.984	.976	.975	.977	.986	.994	.009	.019	.023	.017	.008	.985	.365	.956	.951	.945	.946	.954	.962	.971	.980	.980	.977	.980
New York, N. Y	29.809	.805	.804	.805	.809	.816	.828	.838	.840	.838	.831	.818	.803	.794	.788	.788	.793	.797	.801	.806	.813	.815	.814	.812	.811
Philadelphia, Pa	30.015	.012	.009	.011	.015	.019	.031	.044	.046	.047	.042	.030	.012	.000	.993	.991	.993	.999	.009	.017	.022	.020	.020	.017	.017
Pittsburg, Pa	29.226	.226	.225	.228	.233	.240	.248	.258	.263	.259	.255	.240	.218	.204	.196	.193	.197	.200	.204	.207	.207	.211	.208	.212	.223
Portland, Oreg	29.885	.890	.894	.898	.901	.899	.899	.903	.905	.909	.918	.924	.925	.922	.911	.900	.886	.880	.873	.871	.870	.875	.881	.886	.896
St. Louis, Mo	29.472	.474	.475	.475	.482	.488	.498	.508	.519	.521	.515	.504	.481	.461	.443	.435	.429	.428	.436	.440	.447	.453	.457	.455	.471
St. Paul, Minn	29.108	.114	.115	.114	.117	.121	.126	.129	.135	.137	.135	.130	.115	.099	.085	.079	.076	.079	.083	.089	.093	.098	.102	.104	.108
Salt Lake City, Utah	25.679	.679	.679	.682	.679	.676	.677	.685	.690	.701	.703	.706	.699	.692	.679	.666	.660	.663	.664	.672	.677	.679	.682	.686	.681
San Diego, Cal	29.905	.905	.902	.901	.895	.890	.888	.893	.903	.915	.927	.935	.933	.921	.901	.886	.877	.872	.867	.870	.881	.889	.899	.906	.898
San Francisco, Cal	29.889	.887	.889	.890	.888	.881	.881	.885	.889	.898	.909	.916	.917	.912	.897	.886	.874	.871	.864	.864	.875	.879	.887	.893	.883
Savannah, Ga	29.970	.967	.961	.963	.971	.979	.991	.000	.009	.011	.007	.996	.973	.958	.949	.946	.948	.953	.962	.967	.972	.974	.970	.964	.973
Washington, D. C	30.020	.016	.010	.012	.017	.024	.033	.043	.048	.051	.045	.032	.009	.999	.992	.990	.993	.002	.010	.018	.024	.026	.024	.020	.019

TABLE VII.—*Average wind movement for each hour of seventy-fifth meridian time, October, 1897.*

Stations.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Midnight.	Mean.
Abilene, Tex	6.9	6.6	6.4	6.8	6.5	6.8	6.8	6.0	6.4	7.8	9.9	10.4	11.0	10.8	10.2	10.1	10.4	10.1	8.6	7.7	7.2	7.3	7.4	7.6	8.2
Albany, N. Y	4.8	4.6	4.7	5.4	5.2	5.0	5.0	5.5	6.6	7.4	7.7	8.0	8.3	8.1	7.8	7.1	6.5	5.8	5.3	5.5	5.9	5.6	5.8	5.5	6.1
Alpena, Mich	7.9	7.9	8.1	7.5	7.5	7.8	7.4	7.8	8.9	9.6	10.4	10.0	10.5	10.9	11.1	11.5	11.5	11.1	9.6	9.0	9.0	8.7	8.6	8.6	9.2
Amarillo, Tex	16.4	16.4	15.5	15.2	16.0	16.2	16.2	15.2	14.9	16.2	18.6	19.2	18.6	17.5	16.5	16.5	17.1	17.9	16.9	15.1	14.8	15.5	16.3	16.2	16.5
Atlanta, Ga	7.6	8.1	8.3	8.3	8.3	8.4	7.9	7.8	7.8	7.8	8.2	8.9	9.6	9.4	9.7	9.3	9.3	8.3	7.5	8.3	8.3	8.2	8.5	8.4	8.4
Atlantic City, N. J	13.3	13.3	13.7	13.3	13.5	13.8	13.7	13.7	14.2	14.4	15.3	15.1	14.8	15.0	14.5	14.5	13.7	13.1	13.1	13.3	13.3	13.1	12.8	13.0	13.8
Augusta, Ga	4.8	5.1	5.3	5.0	5.1	5.3	5.3	5.5	6.0	7.4	7.9	7.9	8.2	8.5	8.6	8.1	7.3	6.0	5.3	4.6	4.6	4.5	4.3	4.8	6.1
Baker City, Oreg	6.3	6.9	7.3	7.5	7.8	8.0	7.8	7.7	8.2	7.4	6.9	5.5	5.4	5.2	6.4	7.1	7.5	7.7	7.0	5.3	4.3	4.9	4.9	4.9	6.6
Baltimore, Md	5.0	4.5	4.5	4.7	5.0	5.5	5.0	5.2	5.8	6.2	6.6	6.8	6.6	6.9	6.8	6.6	6.1	5.1	4.6	4.9	5.4	5.3	5.4	4.9	5.6
Bismarck, N. Dak	7.6	8.9	8.7	7.8	7.5	7.4	7.4	7.2	7.3	8.5	10.0	11.7	13.4	13.7	14.1	14.2	14.3	12.5	10.5	8.2	7.1	7.4	8.2	7.2	9.6
Block Island, R. I	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Boston, Mass	10.8	10.5	10.7	11.0	10.5	10.8	11.2	10.6	11.1	11.5	11.9	11.7	12.5	12.0	11.8	11.5	10.7	10.1	10.1	10.3	9.8	9.8	10.1	10.0	10.9
Buffalo, N. Y	11.5	12.0	11.6	12.1	12.7	12.8	12.4	12.9	13.0	13.5	13.4	12.7	12.8	13.4	13.6	13.5	13.5	12.9	13.9	13.9	13.4	13.2	12.6	11.6	12.9
Cairo, Ill	4.8	4.6	4.6	4.8	4.7	5.0	5.0	4.8	5.0	5.6	6.0	6.2	7.6	7.1	7.6	6.9	6.6	6.2	5.5	5.2	4.4	4.3	4.5	4.8	5.5
Cape Henry, Va	17.3	17.0	16.7	17.7	18.6	17.8	17.5	17.3	17.6	18.3	18.3	17.4	18.1	17.8	17.7	17.1	18.2	17.2	17.0	17.5	17.1	17.5	18.1	17.4	17.6
Carson City, Nev	5.2	4.1	4.1	3.5	3.3	2.9	2.5	3.0	3.1	2.4	2.9	3.5	5.4	6.1	7.0	8.3	9.6	10.7	11.4	9.7	7.5	6.4	6.1	5.5	5.6
Charleston, S. C	11.4	11.4	11.3	11.6	11.6	11.6	11.5	11.8	12.5	13.0	13.4	13.4	13.3	14.0	14.9	14.5	13.3	11.5	10.5	10.5	10.6	11.6	12.0	12.1	12.2
Charlotte, N. C	6.5	6.2	6.5	6.5	6.1	6.3	6.1	6.2	7.3	8.0	8.0	7.8	7.7	7.6	7.3	6.8	6.7	5.8	5.6	6.4	6.5	6.4	6.5	6.5	6.7
Chattanooga, Tenn	2.8	2.6	2.6	2.5	2.9	3.1	2.8	3.0	3.5	4.3	6.1	6.4	6.5	6.7	6.9	7.6	7.5	6.7	5.5	4.2	4.3	3.9	4.0	3.9	4.6
Cheyenne, Wyo	7.0	7.9	8.4	8.6	8.8	8.5	8.5	8.9	9.5	9.1	10.6	12.7	14.4	14.7	14.6	15.1	14.8	12.9	11.0	8.9	8.1	8.2	7.7	7.1	10.2
Chicago, Ill	18.1	18.4	17.8	17.3	17.6	17.6	17.7	17.7	17.1	16.5	15.4	15.4	16.3	15.6	15.7	16.1	15.9	15.3	15.7	16.2	16.6	16.7	16.7	17.5	16.7
Cincinnati, Ohio	3.7	3.7	3.9	4.2	4.0	4.1	4.3	4.5	5.4	6.3	6.6	7.6	8.5	8.2	8.3	8.1	8.2	7.1	6.5	5.0	4.5	4.3	4.4	4.3	5.7
Cleveland, Ohio	15.2	15.3	14.8	14.9	15.6	15.5	15.7	16.2	15.8	14.7	14.7	14.7	15.2	15.9	15.9	15.1	14.4	13.4	12.9	13.3	13.6	14.1	14.4	14.6	14.8
Columbia, Mo	7.5	7.2	7.0	6.6	6.1	6.1	6.2	6.0	6.2	6.6	7.5	7.7	8.0	8.4	8.5	8.6	8.4	7.0	6.4	6.4	6.8	7.1	7.4	7.4	7.1
Columbus, Ohio	4.9	4.9	4.9	4.9	5.0	4.8	5.3	5.6	6.5	6.9	7.8	8.4	9.0	9.1	8.9	9.1	8.1	7.0	6.1	6.4	5.9	5.9	5.4	5.3	6.5
Concordia, Kans	6.8	7.0	7.0	6.7	5.6	5.4	5.6	5.2	5.7	7.4	9.2	9.9	10.5	10.8	10.6	11.0	10.8	9.2	7.5	6.3	6.0	6.1	6.5	6.7	7.6
Corpus Christi, Tex	10.5	10.4	9.5	9.2	9.3	8.9	9.1	9.1	9.5	10.1	10.5	10.6	10.6	11.4	12.9	12.7	12.9	13.2	13.2	12.3	11.5	11.3	11.8	10.3	10.9
Davenport, Iowa	5.3	5.5	5.4	5.5	5.2	5.1	5.3	5.2	6.2	6.8	7.1	7.5	8.1	8.6	8.9	9.4	8.7	7.5	5.6	4.7	5.3	5.5	5.2	5.8	6.4
Denver, Colo	7.9	8.0	8.4	8.6	8.7	8.7	9.1	8.7	8.2	8.3	8.7	8.2	7.7	8.4	8.3	9.0	9.1	8.9	9.0	7.9	8.5	8.1	7.8	8.0	8.4
Des Moines, Iowa	5.1	5.4	5.5	4.8	3.0	4.8	4.8	5.0	6.0	7.0	8.3	9.0	9.8	10.9	10.9	11.5	11.1	9.4	7.4	7.1	6.4	6.3	5.3	5.4	7.2
Detroit, Mich	7.5	7.3	7.1	7.7	7.4	7.6	8.1	8.1	8.6	9.6	9.8	9.7	10.2	10.7	10.5	10.0	9.6	8.2	7.4	7.6	8.1	8.1	7.9	7.8	8.5
Dodge City, Kans	10.5	10.7	11.0	10.4	10.0	9.0	8.2	7.7	8.6	11.1	13.5	14.4	15.2	15.0	15.3	15.2	15.0	15.0	12.8	10.2	10.2	10.2	10.4	10.5	11.7
Dubuque, Iowa	5.3	5.4	4.4	3.8	4.0	3.9	4.1	4.3	5.3	6.3	7.7	8.1	8.1	8.8	8.4	8.6	8.2	6.7	5.6	5.9	5.5	5.5	5.7	5.8	6.1
Duluth, Minn	8.5	8.9	7.5	8.0	8.0	8.5	9.1	9.7	9.0	9.0	9.4	9.9	10.7	9.8	10.3	11.1	11.2	10.1	9.0	8.0	8.2	8.3	9.0	8.6	9.2
Eastport, Me	8.7	8.4	8.6	8.3	8.3	9.2	9.1	9.6	9.5	9.9	10.1	10.5	10.6	11.5	11.7	11.8	9.8	9.1	8.6	8.5	8.7	8.5	9.1	8.6	9.5
El Paso, Tex	10.1	10.2	10.0	9.8	9.2	9.2	10.2	9.8	9.3	8.9	9.6	10.3	11.2	11.1	11.5	11.8	11.5	11.2	10.5	8.7	8.2	7.7	8.8	8.7	9.9
Erie, Pa	12.1	11.4	11.5	11.0	11.3	11.3	11.3	11.4	12.2	12.5	12.2	11.7	12.3	12.3	12.1	10.9	10.1	8.5	8.1	8.6	10.3	11.3	12.4	12.4	11.2
Eureka, Cal	4.2	4.1	4.5	4.4	3.8	3.7	3.2	3.2	3.3	3.4	2.7	3.0	4.5	6.0	6.9	8.2	8.4	8.5	8.7	7.5	6.4	5.6	4.7	4.3	5.1
Fort Canby, Wash	11.3	12.2	11.5	11.6	12.5	12.9	12.6	12.9	13.1	12.0	11.3	11.7	12.2	12.5	13.3	13.6	13.8	13.2	12.8	13.0	13.1	12.4	12.0	11.7	12.5
Fort Smith, Ark	4.5	4.7	4.8	4.2	4.4	4.4	4.3	4.5	4.5	5.4	5.7	5.1	5.7	5.9	6.4	6.7	6.0	5.2	4.7	4.5	4.5	4.7	4.8	5.0	5.0
Fresno, Cal	4.5	4.0	4.3	4.0	3.7	3.6	3.4	3.8	3.5	3.6	4.2	4.2	4.7	4.8	4.2	4.2	4.2	3.9	3.9	3.4	2.8	2.9	3.7	3.9	3.9
Galveston, Tex	9.7	10.1	10.1	10.1	9.8	9.6	9.7	10.5	11.2	11.7	11.6	11.4	11.8	11.5	11.5	11.3	10.9	10.8	10.2	9.6	10.0	9.9	10.5	10.7	10.6
Grand Haven, Mich	7.7	7.6	7.5	7.8	7.8	7.7	7.6	7.7	8.3	9.4	9.9	9.6	9.5	9.9	9.7	9.9	8.9	7.5	6.6	6.6	6.9	7.0	7.9	7.9	8.2
Greenbay, Wis	6.0	5.6	5.5	4.8	5.4	6.1	6.1	6.1	6.8	7.4	7.8	8.3	9.4	9.4	9.5	8.6	7.6	7.4	6.8	6.3	6.4	6.5	6.3	6.1	6.9
Hannibal, Mo	7.2	7.4	7.4	6.5	6.5	6.5	6.6	6.8	6.6	7.6	7.9	8.9	9.5	10.4	10.9	10.3	9.8	8.5	6.9	5.7	6.1	6.5	7.4	7.2	7.7
Harrisburg, Pa	4.5	5.0	5.3	5.3	5.1	5.0	5.0	5.3	6.2	6.8	7.5	7.8	8.5	8.2	7.6	7.6	7.0	6.4	6.4	5.8	5.3	4.6	4.5	4.4	6.0
Hatteras, N. C	12.6	12.5	12.5	12.2	12.8	13.5	14.5	13.9	14.5	14.8	14.6	14.7	15.3	15.6	15.0	14.7	14.4	14.2	14.0	12.8	12.7	12.6	12.4	12.1	13.7
Havre, Mont	6.7	6.9	7.4	7.5	7.2	6.9	7.5	7.1	8.2	7.9	9.0	10.8	12.6	13.2	13.2	13.3	12.9	12.5	11.0	8.7	7.0	6.5	7.1	7.4	9.1
Helena, Mont	8.1	6.6	6.6	5.9	6.6	5.9	7.0	6.1	5.9	5.1	5.2	6.1	7.5	7.4	7.7	8.3	8.6	8.4	7.7	7.4	7.9	9.0	8.2	8.4	7.2
Huron, S. Dak	9.9	10.0	10.0	10.7	10.6	11.6	11.0	10.7	10.7	12.4	14.6	15.2	14.6	15.7	16.2	16.7	15.9	14.6	11.1	10.4	10.5	11.4	10.8	10.8	12.4
Idaho Falls, Idaho	7.9	8.5	8.1	7.7	7.8	8.2	9.3	9.3	8.9	8.2	8.5	9.2	10.5	10.5	10.5	10.5	11.8	10.4	9.6	9.2	9.5	9.5	8.4	8.1	9.2
Indianapolis, Ind	8.0	7.5	7.3	7.3	7.8	7.8	7.7	7.5	7.5	8.0	8.4	9.0	9.6	9.5	10.5	10.4	10.4	9.0	8.3	8.4	8.5	8.4	8.3	8.5	8.5
Jacksonville, Fla	5.6	5.9	5.7	5.9	5.5	5.6	5.6	6.1	7.6	8.7	9.2	9.9	10.9	9.9	10.4	10.1	9.5	7.5	6.4	6.0	5.7	5.5	6.0	5.4	7.3
Jupiter, Fla	11.6	11.6	11.8	11.5	10.9	10.9	11.0	10.9	11.5	13.2	13.6	13.9	14.0	13.8	13.8	13.5	13.2	12.5	12.1	12.3	12.5	12.2	11.7	11.5	12.3
Kansas City, Mo	7.2	6.7	6.6	5.8	6.0	6.0	5.7	5.9	6.1	6.8	7.5	7.9	8.8	9.0	9.6	9.6	9.5	8.7	7.2	6.9	7.4	7.7	7.7	7.5	7.4
Keokuk, Iowa	5.8	5.7	5.3	5.3	5.7	5.8	5.8	5.7	5.9	6.5	7.2	7.3	7.7	8.5	8.5	8.6	8.2	6.8	5.4	5.3	6.0	6.0	6.1	6.1	6.5
Key West, Fla	8.6	8.6	8.5	8.2	8.6	9.0	9.0	9.5	9.8	9.8	9.9	10.0	10.3	10.4	10.0	10.5	10.5	10.5	11.1	10.7	10.0	9.6	9.5	9.2	9.7
Kittyhawk, N. C	17.0	17.1	17.7	18.1	17.6	17.8	18.1	17.9	17.5	18.0	19.2	18.4	18.8	18.5	18.3	18.0	17.9	18.1	18.2	18.3	18.7	18.6	18.1	17.7	18.1
Knoxville, Tenn	4.1	4.2	3.6	3.4	4.0	3.8	3.9	3.7	4.1	5.0	5.5	5.5	5.8	6.3	6.6	7.4	7.2	6.5	5.5	5.0	4.3	4.7	4.5	4.0	4.9
La Crosse, Wis	5.5	5.5	5.8	5.8	5.0	5.1	5.0	5.0	5.2	6.8	7.5	7.8	9.3	9.4	9.8	9.6	9.4	8.5	7.4	6.8	6.6	6.2	6.3	5.8	6.9
Lander, Wyo	4.2	3.9	3.1	3.5	2.7	3.1	3.3	3.1	3.3	3.2	3.5	4.6	5.5	5.8	6.4	6.7	6.8	6.4	5.9	4.8	4.3	3.8	4.1	4.3	4.4
Lexington, Ky	7.8	7.9	7.9	8.6	8.5	8.0	8.1	7.9	8.0	9.4	9.9	11.0	11.1	11.3	11.1	11.0	10.0	8.3	7.5	7.6	7.7	8.2	8.2	8.2	8.9
Little Rock, Ark	3.4	3.5	3.4	4.0	3.7	4.1	4.3	4.3	4.6	4.9	5.6	6.2	6.9	7.0	6.9	6.6	6.6	6.1	4.9	4.3	4.0	4.0	3.8	3.8	4.9
Los Angeles, Cal	2.2	2.4	2.5	2.4	2.5	2.5	2.9	2.9	2.5	2.9	3.2	3.5	3.9	4.2	5.1	6.2	7.2	7.7	7.7	6.6	4.8	3.4	2.9	2.5	3.9
Louisville, Ky	5.5	5.0	5.3	6.0	6.0	5.8	6.1	6.4	6.2	6.8	7.3	7.3	8.0	8.5	8.7	8.5	8.4	7.6	6.6	6.3	6.1	5.6	5.9	5.3	6.6
Lynchburg, Va	3.1	2.6	2.5	2.6	2.4	2.4	2.3	2.1	3.3	4.2	4.6	5.0	5.6	5.6	6.0	5.5	5.1	4.4	3.5	3.2	3.0	2.6	3.5	3.1	3.7
Marquette, Mich	9.6	9.3	9.0	9.4	9.0	8.7	8.3	8.3	8.8	9.7	10.2	10.6	11.6	11.1	11.6	11.0	10.5	10.0	10.2	10.2	10.3	10.6	11.1	11.0	10.0
Memphis, Tenn	7.8	7.5	7.5	7.7	8.1	7.7	7.3	7.4	7.0	7.5	7.0	6.5	7.5	8.1	8.4	8.4	8.5	8.1	6.8	7.6	8.1	8.1	8.4	8.3	7.7
Milwaukee, Wis	9.0	9.1	8.6	8.7	8.4	8.1	8.1	8.2	8.6	9.9	10.5	10.8	11.8	12.5	12.7	12.1	11.1	10.0	9.1	8.3	8.3	8.5	8.7	8.6	9.6
Mobile, Ala	4.8	5.5	5.2	5.4	5.4	5.3	5.1	5.1	5.3	6.1	6.5	6.1	6.8	7.5	8.4	9.1	9.1	7.0	6.3	6.2	5.7	4.9	5.2	5.1	6.1
Montgomery, Ala	4.1	4.2	4.5	4.4	4.5	4.4	4.0	4.1	5.3	6.5	7.1	7.5	7.2	7.6	7.8	7.6	7.9	6.7	5.3	5.6	5.4	5.4	5.9	5.5	5.8
Moorhead, Minn	9.0	8.3	9.0	8.7	9.0	9.0	9.2	9.5	9.9	10.4	10.9	11.7	12.7	12.9	13.5	12.8	13.0	11.8	9.2	8.5	8.8	8.9	9.1	9.2	10.2
Nantucket, Mass	11.5	12.2	12.6	12.4	12.5	12.8	12.7	14.0	14.5	15.4	15.0	14.7	14.6	14.6	14.5	14.2	13.4	12.5	11.9	12.4	12.3	12.4	11.7	11.8	13.2
Nashville, Tenn	3.2	3.5	2.9	2.8	2.5	2.5	2.4	2.9	3.4	3.7	4.6	5.8	6.9	8.0	8.1	7.4	7.6	7.7	6.0	5.0	4.2	3.5	3.5	3.1	4.6
New Haven, Conn	8.5	8.7	9.2	9.5	9.6	9.5	9.3	9.5	11.1	11.2	10.5	10.7	12.0	12.2	11.1	10.6	9.5	8.1	8.1	8.1	8.3	8.8	9.3	9.3	9.7
New Orleans, La	5.9	5.8	6.1	6.2	6.4	6.5	6.4	7.0	7.4	8.5	9.0	9.2	9.6	10.0	9.9	9.1	7.7	7.3	5.5	5.0	5.1	5.2	5.6	5.8	7.1
New York, N. Y	12.8	12.9	13.2	13.1	13.0	12.6	12.1	12.6	13.8	13.4	13.6	12.9	12.9	13.9	14.1	13.7	14.2	13.4	14.0	13.8	13.7	14.0	13.7	13.6	13.4
Norfolk, Va	8.0	7.7	7.9	8.2	8.3	7.9	8.1	8.6	9.0	9.8	10.2	10.7	11.0	10.6	10.1	9.4	9.2	8.4	8.3	8.2	8.1	8.1	8.2	7.9	8.8
Northfield, Vt	7.3	6.0	6.2	6.1	6.2	6.1	6.2	6.9	7.1	8.9	10.1	10.9	12.2	11.9	11.5	10.7	9.1	8.0	8.5	9.3	8.6	8.2	7.5	7.2	8.4
North Platte, Nebr	8.9	8.4	9.2	8.8	8.7	8.2	8.7	8.2	8.5	9.2	10.8	10.5	11.1	11.9	12.4	13.0	12.7	11.6	10.2	8.4	8.2	8.3	8.8	8.7	9.7
Oklahoma, Okla	7.3	7.2	7.3	7.3	7.4	8.1	7.6	7.5	7.9	9.4	11.0	11.3	11.9	11.6	11.6	11.3	11.5	10.8	8.9	8.3	8.0	8.1	7.3	7.7	9.0
Omaha, Nebr	6.6	6.5	6.1	6.2	6.2	5.7	5.8	5.9	6.7	7.9	9.0	9.1	9.7	10.1	10.9	10.6	10.4	9.1	7.4	7.3	7.3	7.5	7.4	7.0	7.8
Oswego, N. Y	10.1	10.2	10.8	11.0	11.0	10.9	11.7	11.9	12.1	12.3	11.3	10.9	11.2	10.7	10.9	10.9	9.9	8.8	8.6	9.0	9.9	10.4	10.4	10.3	10.6
Palestine, Tex	3.9	3.9	3.5	3.6	3.6	3.5	3.4	3.7	4.2	5.5	6.3	6.9	6.9	6.9	6.7	6.8	7.0	6.3	5.0	3.8	4.1	3.9	4.4	4.4	4.9
Parkersburg, W. Va	3.6	3.5	3.4	3.4	3.2	3.2	3.0	3.4	3.9	5.0	5.8	6.6	7.2	7.8	8.0	7.5	6.5	5.0	3.7	3.8	4.1	3.5	3.4	4.0	4.7

TABLE VII.—*Average wind movement, etc.*—Continued.

Stations.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Midnight.	Mean.
Pensacola, Fla.	8.5	8.7	8.8	9.2	8.9	8.7	8.8	8.8	9.3	9.7	9.3	9.7	10.0	9.6	9.6	9.7	9.8	9.8	7.6	7.2	7.5	8.3	8.5	8.6	8.9
Philadelphia, Pa.	9.8	10.4	10.2	10.1	10.9	10.3	10.1	10.9	11.6	11.6	11.1	11.2	11.5	11.6	11.7	11.6	11.3	10.3	10.6	10.5	10.3	10.1	9.8	9.7	10.7
Phœnix, Ariz.	3.1	3.4	3.3	3.3	3.5	3.4	3.3	3.3	3.5	3.8	3.3	4.0	4.4	5.1	4.8	5.0	5.3	4.8	4.4	3.4	3.7	3.5	3.5	2.8	3.8
Pierre, S. Dak.	6.9	6.5	7.5	7.3	6.9	7.1	6.5	6.4	6.1	6.9	8.9	10.6	11.8	12.3	12.8	12.7	11.7	11.5	10.0	8.8	9.0	7.6	7.3	7.5	8.8
Pittsburg, Pa.	3.8	3.7	3.6	3.0	3.7	3.1	3.3	3.7	4.1	5.7	6.5	6.6	7.3	7.5	7.8	7.4	7.4	6.3	5.5	5.4	5.6	5.5	4.6	4.2	5.2
Port Angeles, Wash.	4.9	5.3	5.3	4.9	4.9	4.9	4.5	4.7	4.4	4.8	4.5	3.4	3.5	4.5	4.7	4.5	4.5	4.3	3.9	3.7	3.5	4.4	4.7	4.8	4.5
Port Huron, Mich.	9.1	8.9	8.1	8.9	9.1	8.8	9.1	9.0	9.1	10.2	10.2	10.6	11.8	12.7	12.0	11.5	10.7	9.6	9.0	9.0	8.9	8.8	9.1	9.1	9.7
Portland, Me.	6.5	6.4	6.5	6.5	6.5	6.4	6.7	6.9	7.6	7.9	8.7	9.4	10.0	10.5	10.1	9.2	8.0	6.5	6.0	6.3	6.5	6.4	6.5	6.4	7.4
Portland, Oreg.	5.4	6.8	6.9	6.4	6.2	6.1	5.9	5.5	6.0	6.4	6.3	6.1	6.8	7.4	7.8	7.9	7.5	8.0	8.0	7.1	6.3	6.0	6.4	5.9	6.6
Pueblo, Colo.	7.5	6.8	6.5	7.1	6.4	6.5	6.6	6.8	6.8	6.7	7.4	6.4	7.5	8.5	9.4	10.3	10.3	9.7	11.1	9.0	8.7	7.9	7.4	6.5	7.8
Raleigh, N. C.	6.0	5.8	6.2	6.3	6.2	6.5	6.4	6.9	7.5	8.0	8.6	8.6	8.7	8.1	8.1	7.9	7.6	6.7	6.6	6.7	6.5	6.8	6.6	6.3	7.1
Rapid City, S. Dak.	6.8	7.3	7.5	7.0	7.7	7.2	8.0	7.2	7.0	6.6	8.2	9.5	10.8	12.2	12.7	12.8	11.7	11.2	8.8	6.4	5.9	5.9	6.4	6.4	8.4
Redbluff, Cal.	4.9	5.2	5.0	5.1	4.9	5.0	4.7	5.3	5.6	5.3	5.6	6.2	7.3	7.1	7.1	6.9	7.4	7.5	7.5	6.7	5.6	5.6	5.0	4.8	5.9
Rochester, N. Y.	6.2	6.3	6.4	6.8	6.7	6.7	6.7	6.8	7.7	7.9	7.9	8.3	8.2	8.1	8.3	8.1	7.5	6.5	6.4	6.1	6.1	6.1	6.0	5.8	7.0
Roseburg, Oreg.	2.0	1.8	1.5	1.4	1.4	1.5	1.5	1.9	1.8	1.8	2.0	2.0	2.3	2.5	3.3	4.3	4.5	4.8	4.5	4.4	3.5	2.9	1.8	1.8	2.6
Sacramento, Cal.	8.5	8.3	8.8	8.8	8.8	7.9	8.3	8.1	7.4	7.7	7.4	7.3	7.8	8.5	8.9	8.1	8.4	8.5	8.8	8.5	8.4	9.0	9.6	9.1	8.4
St. Louis, Mo.	8.1	7.8	7.6	8.1	8.2	7.4	6.9	6.3	6.7	7.5	7.9	7.8	8.0	8.2	7.9	8.5	8.6	8.0	7.0	7.3	7.9	8.0	8.6	8.6	7.8
St. Paul, Minn.	5.6	5.3	5.1	6.0	6.2	5.8	6.0	6.2	6.2	7.6	8.8	9.7	9.9	10.1	10.2	10.5	9.9	8.8	8.3	7.8	8.3	7.2	6.9	6.3	7.6
Salt Lake City, Utah.	4.5	5.1	5.2	4.4	4.6	4.8	4.2	3.9	4.4	3.7	3.8	4.9	6.0	7.5	8.8	8.9	10.0	10.2	8.9	6.9	5.7	5.0	5.0	4.7	5.9
San Antonio, Tex.	6.4	5.3	6.0	6.1	5.7	5.3	5.6	5.8	6.0	6.4	8.4	8.9	9.5	9.6	9.9	10.0	10.7	10.4	9.7	8.4	8.9	8.5	8.1	7.0	7.8
San Diego, Cal.	3.9	3.7	4.3	4.1	4.4	4.2	4.0	4.4	4.8	4.2	3.5	4.3	5.8	7.4	9.4	10.8	11.0	10.8	10.2	8.9	6.6	4.8	4.1	3.8	6.0
Sandusky, Ohio	7.7	7.7	8.2	8.0	8.0	8.3	8.2	8.0	8.2	8.5	8.7	9.3	9.6	9.5	9.8	8.9	8.8	7.4	7.0	7.1	7.5	7.3	7.3	7.5	8.2
San Francisco, Cal.	9.9	9.3	8.6	8.8	7.8	6.6	7.1	6.7	6.5	6.0	6.6	7.1	7.8	8.1	8.8	10.4	12.8	14.3	14.7	15.3	13.7	12.9	12.0	11.2	9.7
San Luis Obispo, Cal.	3.1	3.0	2.5	2.5	2.7	3.2	3.1	3.0	2.8	3.4	3.3	3.9	4.5	5.1	5.8	7.5	8.6	8.8	7.8	6.4	4.9	4.3	3.5	3.3	4.5
Santa Fe, N. Mex.	6.2	6.1	6.0	5.6	4.9	4.3	4.5	4.8	5.0	5.2	6.9	8.1	8.4	8.5	9.3	9.2	9.1	9.0	8.2	5.3	5.3	5.8	6.7	7.1	6.6
Sault Ste Marie, Mich.	7.7	7.3	6.7	6.9	7.4	7.7	7.4	7.5	8.1	8.2	8.6	9.3	9.7	10.8	11.8	11.4	10.9	10.4	9.3	9.8	9.3	9.1	8.3	8.3	8.8
Savannah, Ga.	7.4	7.8	7.8	7.9	7.7	7.7	7.7	7.8	8.4	9.4	10.2	9.9	10.6	11.1	11.0	10.9	10.0	8.3	7.8	7.8	7.8	7.4	7.3	7.4	8.6
Seattle, Wash.	3.2	3.6	3.5	3.5	3.7	4.1	4.0	3.4	3.5	3.5	3.6	4.1	3.9	4.8	4.9	5.2	5.2	5.0	4.9	4.8	4.5	4.4	3.7	3.5	4.1
Shreveport, La.	4.8	4.4	4.0	4.2	4.5	4.1	4.0	3.8	3.9	5.2	5.7	6.4	7.2	7.6	7.0	7.1	6.9	6.3	4.8	4.5	4.7	5.1	5.2	5.3	5.3
Sioux City, Iowa	9.9	9.6	10.4	10.9	10.8	10.1	10.1	10.5	10.2	10.5	11.7	12.2	14.0	15.6	15.7	16.8	16.6	15.0	12.3	11.3	11.2	12.1	11.8	10.9	12.1
Spokane, Wash.	3.4	3.4	3.3	3.2	3.3	3.1	3.1	3.5	3.4	3.5	3.9	4.5	5.0	5.3	5.5	5.2	5.2	5.3	4.6	4.5	4.1	3.7	3.8	3.8	4.1
Springfield, Ill.	8.0	7.7	7.8	7.4	7.2	7.2	7.4	7.4	7.8	8.0	8.1	8.0	8.6	9.0	9.1	9.2	8.9	7.7	6.9	7.5	7.7	8.0	8.0	7.8	7.9
Springfield, Mo.	9.8	9.5	9.3	9.5	9.1	9.1	8.9	8.3	8.5	8.5	9.2	9.0	9.7	9.8	10.4	10.5	9.9	9.7	7.5	7.4	8.4	9.3	10.0	10.1	9.2
Tacoma, Wash.	2.7	3.0	2.7	2.9	3.7	3.5	3.3	2.6	2.8	3.2	3.8	4.3	4.7	5.0	6.0	6.1	6.1	5.2	5.1	5.0	5.0	4.8	3.9	3.0	4.1
Tampa, Fla.	4.8	4.8	4.8	4.8	4.7	4.4	4.6	5.3	6.4	7.8	8.0	8.2	9.2	9.2	9.2	9.5	9.4	7.5	6.4	6.2	5.8	5.3	5.3	4.6	6.5
Tatoosh Island, Wash.	12.8	14.1	14.3	14.5	15.2	13.8	12.9	13.3	13.9	14.1	14.2	14.3	13.9	14.6	14.2	14.6	13.6	13.4	12.7	12.8	12.3	11.6	11.6	12.0	13.5
Toledo, Ohio	8.1	7.9	7.9	7.8	8.0	7.9	8.2	8.0	8.6	9.7	10.0	10.9	11.5	11.6	11.6	11.7	10.9	9.2	8.3	8.2	8.3	8.3	8.1	7.6	9.1
Vicksburg, Miss.	5.1	4.7	4.6	4.9	5.4	5.2	5.4	6.1	6.1	5.9	5.3	5.8	6.5	6.7	7.2	7.3	6.6	5.3	4.0	4.5	5.4	5.3	5.6	5.6	5.6
Vineyard Haven, Mass.	10.3	10.0	10.4	10.0	10.4	10.3	10.5	11.0	11.5	11.5	11.5	11.6	11.7	10.9	11.4	11.1	10.4	10.0	9.9	10.5	10.1	9.7	10.0	10.0	10.6
Walla Walla, Wash.	4.4	4.3	4.2	4.4	4.3	4.5	4.2	4.2	4.5	4.5	4.1	4.6	5.2	5.5	5.6	5.1	5.1	5.0	4.5	4.0	4.1	5.0	4.9	4.6	4.6
Washington, D. C.	4.5	4.5	4.6	5.2	5.8	5.6	4.9	5.9	6.4	6.9	7.6	8.1	8.4	8.4	8.7	8.0	8.1	7.0	6.3	5.9	5.5	5.1	5.0	5.3	6.3
Wichita, Kans.	7.1	7.4	7.0	6.7	6.6	6.5	6.9	6.8	7.0	7.6	8.3	9.1	10.6	10.8	11.1	11.2	10.7	9.6	7.7	6.5	6.8	7.5	7.2	7.2	8.1
Williston, N. Dak.	7.0	7.0	6.1	6.0	6.0	5.7	5.9	5.9	6.0	6.4	7.7	8.9	10.5	11.7	12.9	13.8	14.1	13.3	11.5	9.9	8.5	8.6	8.5	7.8	8.7
Wilmington, N. C.	7.8	7.9	7.8	8.1	8.2	7.7	7.8	7.6	8.3	9.2	9.9	9.8	10.1	10.5	10.9	10.3	9.9	8.3	7.5	8.1	8.4	7.8	7.8	7.8	8.7
Woods Hole, Mass.	13.9	14.0	13.9	14.4	14.3	14.4	14.1	13.9	14.9	14.7	14.3	14.0	14.8	14.0	15.2	15.3	14.4	14.1	13.7	13.7	13.7	13.5	13.8	13.9	14.2
Yankton, S. Dak.	6.9	7.4	7.2	7.6	7.8	7.2	7.2	7.6	7.3	8.3	9.4	10.5	11.7	12.8	13.4	13.5	12.8	11.3	8.6	7.9	7.5	7.1	6.9	6.8	8.9

TABLE VIII.—*Resultant winds from observations at 8 a. m. and 8 p. m., daily, during the month of October, 1897.*

Stations.	Component direction from— N.	S.	E.	W.	Resultant. Direction from—	Duration.
New England.	*Hours.*	*Hours.*	*Hours.*	*Hours.*	°	*Hours.*
Eastport, Me	22	24	8	25	s. 83 w.	17
Portland, Me	21	19	2	33	n. 87 w.	31
Northfield, Vt	14	44	2	9	s. 13 w.	31
Boston, Mass	25	14	11	25	n. 50 w.	17
Nantucket, Mass	19	16	22	15	n. 67 e.	8
Woods Hole, Mass.*	11	10	11	7	n. 76 e.	4
Block Island, R. I	26	12	22	20	n. 8 e.	14
New Haven, Conn	33	13	16	16	n.	20
Middle Atlantic States.						
Albany, N. Y	21	27	8	14	s. 45 w.	8
Binghamton, N. Y.†	11	4	17	5	s. 60 e.	14
New York, N. Y	28	16	19	15	n. 18 e.	13
Harrisburg, Pa	22	11	28	14	n. 52 e.	18
Philadelphia, Pa	30	14	23	15	n. 27 e.	18
Atlantic City, N. J	24	14	25	13	n. 50 e.	16
Baltimore, Md	28	13	22	11	n. 36 e	19
Washington, D. C	34	14	20	10	n. 27 e.	22
Lynchburg, Va	28	17	17	13	n. 20 e.	12
Norfolk, Va	32	12	27	7	n. 45 e.	28
South Atlantic States.						
Charlotte, N. C	24	15	30	7	n. 69 e.	25
Hatteras, N. C	33	9	29	8	n. 41 e.	32
Kittyhawk, N. C.	31	11	32	9	n. 49 e.	30
Raleigh, N. C	38	10	13	10	n 6 e.	28
Wilmington, N. C	31	8	20	14	n. 15 e.	24
Charleston, S. C.	33	9	21	9	n. 27 e.	27
Augusta, Ga	25	5	15	21	n. 17 w.	21
Savannah, Ga	32	12	18	11	n. 19 e.	21
Jacksonville, Fla	31	8	26	14	n. 28 e.	26
Florida Peninsula.						
Jupiter, Fla	29	6	26	12	n. 31 e.	27
Key West, Fla	30	7	36	4	n. 54 e.	39
Tampa, Fla	38	2	21	16	n. 8 e.	36
Eastern Gulf States.						
Atlanta, Ga	28	7	30	16	n. 34 e.	25
Pensacola, Fla	26	17	22	16	n. 34 e.	11
Mobile, Ala	31	16	12	18	n. 22 w.	16
Montgomery, Ala	21	11	33	8	n. 68 e.	27
Vicksburg, Miss	20	13	36	4	n. 78 e.	33
New Orleans, La	22	13	35	5	n. 73 e.	31
Western Gulf States.						
Shreveport, La	21	22	27	13	s. 86 e.	14
Fort Smith, Ark	15	9	37	9	n. 78 e.	29
Little Rock, Ark	16	12	21	23	n. 27 w.	4
Corpus Christi, Tex	20	19	27	8	n. 87 e.	19
Galveston, Tex	14	21	30	11	s. 70 e.	20
Palestine, Tex	32	16	22	10	n. 37 e.	20
San Antonio, Tex	28	19	24	8	n. 61 e.	18
Ohio Valley and Tennessee.						
Chattanooga, Tenn	25	17	19	15	n. 27 e.	9
Knoxville, Tenn	35	13	19	13	n. 15 e.	23
Memphis, Tenn	25	18	19	13	n. 41 e.	9
Nashville, Tenn	26	15	13	23	n. 42 w.	15
Lexington, Ky	18	20	19	16	s. 56 e.	4
Louisville, Ky	32	20	13	9	n. 18 e.	13
Indianapolis, Ind	26	20	20	11	n. 56 e	11
Cincinnati, Ohio	22	18	24	14	n. 68 e.	11
Columbus, Ohio	19	20	25	12	s. 86 e.	13
Pittsburg, Pa	15	20	24	16	s. 58 e.	9
Parkersburg, W. Va	18	22	19	10	s. 66 e.	10
Lower Lake Region.						
Buffalo, N. Y	15	23	22	18	s. 27 e.	9
Oswego, N. Y	10	36	21	9	s. 25 e.	29
Rochester, N. Y	10	28	14	28	s. 38 w.	23
Erie, Pa	7	36	16	10	s. 12 e.	30
Cleveland, Ohio	15	31	25	8	s. 47 e.	23
Sandusky, Ohio	14	23	20	20	s.	9
Toledo, Ohio	14	15	24	22	s. 8 e.	2
Detroit, Mich	20	15	20	21	n. 11 w.	5
Upper Lake Region.						
Alpena, Mich	15	23	20	18	s. 14 e.	8
Grand Haven, Mich	17	12	28	16	n. 67 e.	13
Marquette, Mich	18	28	10	21	s. 48 w.	15
Port Huron, Mich	19	27	17	14	s. 21 e.	8
Sault Ste. Marie, Mich	15	15	24	13	e.	11
Chicago, Ill	15	22	21	18	s. 23 e.	8
Milwaukee, Wis	15	20	18	22	s. 39 w.	6
Upper Lake Region—Cont'd.	*Hours.*	*Hours.*	*Hours.*	*Hours.*	°	*Hours.*
Greenbay, Wis	14	24	15	19	s. 22 w.	11
Duluth, Minn	30	10	11	27	n. 39 w.	26
North Dakota.						
Moorhead, Minn	22	20	19	21	n. 45 w.	3
Bismarck, N. Dak	26	15	16	23	n. 32 w.	13
Williston, N. Dak	19	22	9	24	s. 79 w.	15
Upper Mississippi Valley.						
St. Paul, Minn	18	24	15	20	s. 40 w.	8
La Crosse, Wis. †	8	19	1	7	s. 29 w.	12
Davenport, Iowa	11	15	26	22	s. 45 e.	6
Des Moines, Iowa	19	21	19	18	n. 27 e.	2
Dubuque, Iowa	9	30	16	22	s. 16 w.	22
Keokuk, Iowa	15	23	22	17	s. 32 e.	9
Cairo, Ill	26	20	17	14	n. 27 e.	7
Springfield, Ill	16	23	19	18	s. 8 e.	7
Hannibal, Mo. †	4	11	10	13	s. 23 w.	8
St. Louis, Mo	17	21	24	13	s. 70 e.	12
Missouri Valley.						
Columbia, Mo.*	5	9	14	6	s. 63 e.	9
Kansas City, Mo	18	30	18	8	s. 40 e.	16
Springfield, Mo	13	29	28	9	s. 50 e.	25
Lincoln, Nebr	20	27	19	12	s. 45 e.	10
Omaha, Nebr	19	28	13	14	s. 6 w.	9
Sioux City, Iowa†	11	13	11	5	s. 72 e.	6
Pierre, S. Dak	24	18	21	14	n. 49 e.	9
Huron, S. Dak	22	24	15	19	s. 63 w.	4
Yankton, S. Dak †	9	8	8	8	n.	1
Northern Slope.						
Havre, Mont	12	11	8	36	n. 88 w.	28
Miles City, Mont	14	27	12	24	s. 43 w.	18
Helena, Mont	13	26	2	39	s. 71 w.	39
Rapid City, S. Dak	23	13	12	32	n. 63 w.	22
Cheyenne, Wyo	27	15	7	27	n. 59 w.	23
Lander, Wyo	7	32	15	26	s. 24 w.	27
North Platte, Nebr	21	22	9	24	s. 86 w.	15
Middle Slope.						
Denver, Colo	16	32	10	16	s. 12 w.	17
Pueblo, Colo	24	14	15	22	n. 35 w.	12
Concordia, Kans	15	34	14	8	s. 18 e.	20
Dodge City, Kans	17	34	6	13	s. 22 w.	18
Wichita, Kans	17	28	20	10	s. 42 e.	15
Oklahoma, Okla	15	34	13	12	s. 3 e.	19
Southern Slope.						
Abilene, Tex	12	34	22	11	s. 26 e.	25
Amarillo, Tex	17	38	3	7	s. 13 w.	18
Southern Plateau.						
El Paso, Tex	21	12	26	21	n. 29 e.	10
Santa Fe, N. Mex	15	27	23	8	s. 51 e.	19
Phœnix, Ariz	19	10	29	18	n. 51 e.	14
Yuma, Ariz	23	7	11	32	n. 53 w.	26
Middle Plateau.						
Carson City, Nev	25	14	15	22	n. 32 w.	13
Winnemucca, Nev	20	12	17	13	n. 27 e.	9
Salt Lake City, Utah	14	22	18	19	s. 7 w.	8
Northern Plateau.						
Baker City, Oreg	16	36	14	7	s. 19 e.	21
Idaho Falls, Idaho	21	30	6	9	s. 18 w.	10
Spokane, Wash	18	19	25	13	s. 85 e.	12
Walla Walla, Wash	6	35	10	19	s. 17 w.	30
North Pacific Coast Region.						
Fort Canby, Wash	11	24	21	13	s. 32 e.	15
Port Angeles, Wash.*	6	3	15	13	n. 34 e.	4
Seattle, Wash	15	25	20	12	s. 39 e.	13
Tacoma, Wash†	26	15	9	15	n. 29 w.	12
Tatoosh Island, Wash	2	15	43	5	s. 71 e.	40
Portland, Oreg	23	21	14	23	n. 77 w.	9
Roseburg, Oreg	21	11	20	18	n. 11 e.	10
Middle Pacific Coast Region.						
Eureka, Cal	20	19	18	18	n.	1
Redbluff, Cal	32	17	12	19	n. 25 w.	17
Sacramento, Cal	17	32	9	16	s. 25 w.	17
San Francisco, Cal	7	13	1	48	s. 83 w.	47
South Pacific Coast Region.						
Fresno, Cal	22	10	18	25	n. 30 w.	14
Los Angeles, Cal	20	9	10	33	n. 44 w.	26
San Diego, Cal	31	5	16	26	n. 21 w.	28
San Luis Obispo, Cal	27	13	3	25	n. 58 w.	26

*From observations at 8 p. m. only. †From observations at 8 a. m. only.

TABLE IX.—*Thunderstorms and auroras, October, 1897.*

States.	No. of stations.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total. No.	Total. Days.	
Alabama	52	T.										5	5						1															11	3	T.
		A.																																0	0	A.
Arizona	52	T.				1	4	3	4	2	1					1					1					2	1				1			21	11	T.
		A.																													1			1	1	A.
Arkansas	61	T.									1	12	5							1	1		2	1								1		24	8	T.
		A.																																0	0	A.
California	181	T.					9	4								1								1	2									17	5	T.
		A.																																0	0	A.
Colorado	75	T.	1	1	8	4		1	3	3	1	1				2	2	6	2							2	8	1						46	16	T.
		A.																																0	0	A.
Connecticut	14	T.																																0	0	T.
		A.																																0	0	A.
Delaware	3	T.							1																				1			1		2	2	T.
		A.																								1				1				3	3	A.
Dist. of Columbia	4	T.																																0	0	T.
		A.																																0	0	A.
Florida	45	T.						1			2	3	1		3			1	1	2	3			1										18	10	T.
		A.																																0	0	A.
Georgia	62	T.								1	3	6	6	1							1													18	6	T.
		A.																																0	0	A.
Idaho	30	T.	2						6	2	2			1		1									1	2								17	8	T.
		A.																																0	0	A.
Illinois	92	T.										6	6				1													1				14	4	T.
		A.									1					1										1								3	3	A.
Indiana	54	T.										1	5	1							4													11	4	T.
		A.																										1						1	1	A.
Indian Territory	7	T.										2											1											3	2	T.
		A.																																0	0	A.
Iowa	122	T.				1						1					2	2		1														7	5	T.
		A.																												1				1	1	A.
Kansas	85	T.										11					4	1	2				3				3	4						28	7	T.
		A.			1	1		1																									1	4	4	A.
Kentucky	52	T.										8	1																					9	2	T.
		A.																																0	0	A.
Louisiana	50	T.									7	11	13	3		1	2						1	1					1	2		3	5	50	12	T.
		A.																																0	0	A.
Maine	14	T.												1				2																3	2	T.
		A.	6	1								1								1									5		4	1		19	7	A.
Maryland	35	T.		2					7					3										4		1	1				1			19	7	T.
		A.																																0	0	A.
Massachusetts	24	T.												2																				2	1	T.
		A.																							1				1					2	2	A.
Michigan	112	T.			1	3	4	4		1			2		1		3	3			14													36	10	T.
		A.	2			1																												3	2	A.
Minnesota	69	T.		1	6	7										3	8	1		1														27	7	T.
		A.			1																								3	1	3			8	4	A.
Mississippi	46	T.									1	8	9			1								1										20	5	T.
		A.																																0	0	A.
Missouri	95	T.									1	23	2				1		2	1		2	7											39	8	T.
		A.																																0	0	A.
Montana	37	T.		1										1													1							3	3	T.
		A.																		1	2		1	1		1		1	4	2	4	3		20	10	A.
Nebraska	143	T.			4							1					7	1	1									1						15	6	T.
		A.																																0	0	A.
Nevada	48	T.	4	1			7	8	4	3	3	1			5	1								1	2	1								41	13	T.
		A.																																0	0	A.
New Hampshire	14	T.												1																	1			2	2	T.
		A.	6																	3									5		1			15	4	A.
New Jersey	55	T.						1	2				1	7	1																2			14	6	T.
		A.																																0	0	A.
New Mexico	39	T.			1	3		1	2	3	2															1						1		14	8	T.
		A.																																0	0	A.
New York	103	T.	1	1	1									13				1												20		1		38	7	T.
		A.	1	1								1					1		1	1									3		2			11	8	A.
North Carolina	59	T.		1					1			12	6	5																	1			26	6	T.
		A.																																0	0	A.
North Dakota	46	T.			1																						1							2	2	T.
		A.		2														1	1	1								3	11	3	3			25	8	A.
Ohio	135	T.										1	2	3																1				7	4	T.
		A.					1											1																2	2	A.
Oklahoma	23	T.									3	2					1					1	3											10	5	T.
		A.																																0	0	A.
Oregon	62	T.							2	1																								3	2	T.
		A.																									1							1	1	A.
Pennsylvania	105	T.												5										4						12	1			22	4	T.
		A.																							1				1					2	2	A.
Rhode Island	5	T.																																0	0	T.
		A.																																0	0	A.
South Carolina	43	T.										8	11	2																				21	3	T.
		A.																																0	0	A.
South Dakota	44	T.		1	8	2										2	3																	16	5	T.
		A.																					1			1			5	1	1	1		10	6	A.
Tennessee	65	T.									1	13	6	1																				21	4	T.
		A.																																0	0	A.
Texas	85	T.									7	8	1										11					5	1	1	2	6	3	45	10	T.
		A.																																0	0	A.
Utah	41	T.	4		2		5	7	5	6	3				3	1	2	1									1							40	12	T.
		A.																																0	0	A.
Vermont	13	T.											1	3				1																5	3	T.
		A.	2	1															1	1									3	1				9	6	A.
Virginia	49	T.																																0	0	T.
		A.																																0	0	A.
Washington	50	T.												3	1																			4	2	T.
		A.																																0	0	A.
West Virginia	35	T.																																0	0	T.
		A.																																0	0	A.
Wisconsin	61	T.	1		2	4	1	5				1					4	7		1	4	1												31	11	T.
		A.	2												1																2	1		6	4	A.
Wyoming	14	T.	1													1																		2	2	T.
		A.																											1					1	1	A.
Sums	2,810	T.	14	9	34	25	30	35	37	22	38	145	83	56	14	15	40	27	9	7	28	4	28	14	5	10	16	11	2	38	9	12	8	825	....	T.
		A.	19	5	2	2	1	1	0	0	1	2	0	0	1	1	1	2	3	8	2	0	2	1	2	3	1	5	43	9	21	7	1	146	....	A.

TABLE X.—*Hourly sunshine as deduced from sunshine recorders, October, 1897.*

Stations.	Instrument.	Percentages for each hour of local mean time ending with the respective hour.																Hours of sunshine.			
		A. M.								P. M.								Total.			Personal estimate.
		5	6	7	8	9	10	11	Noon	1	2	3	4	5	6	7	8	Actual.	Possible.	Per cent of possible.	
																		Hours.	*Hours.*		
Albany, N. Y	T.	......	100	43	61	89	98	95	96	97	96	95	87	70	64	......	......	289.6	341.8	85	61
Atlanta, Ga	T.	......	82	61	65	65	71	76	75	71	71	68	65	67	69	......	......	241.5	350.9	69	71
Atlantic City, N. J	P.	......	45	52	50	56	55	54	52	57	62	57	51	48	63	......	......	187.8	346.0	54	47
Baltimore, Md	T.	......	45	26	34	46	55	59	64	65	68	63	51	39	45	......	......	180.4	346.0	52	46
Binghamton, N. Y	T.	......	0	32	32	43	70	75	73	77	74	72	65	50	55	......	......	208.3	342.5	61	53
Bismarck, N. Dak	P.	......	0	51	57	61	68	66	64	58	59	53	53	56	51	......	......	198.2	336.7	59	53
Boston, Mass	T.	......	0	56	66	69	70	75	75	72	71	69	61	56	54	......	......	230.5	342.5	67	59
Buffalo, N. Y.	T.	......	25	35	40	57	67	73	73	68	67	60	49	34	20	......	......	192.3	341.8	56	37
Charleston, S. C.	T.	......	67	24	27	38	47	51	63	63	51	48	48	43	53	......	......	162.1	351.5	46	45
Chattanooga, Tenn	T.	......	67	61	58	75	82	85	83	81	79	82	73	71	78	......	......	265.1	350.1	76	75
Cheyenne, Wyo	P.	......	82	54	60	67	74	71	73	71	71	64	64	52	51	......	......	224.5	343.9	65	54
Chicago, Ill	T.	......	100	48	63	80	81	83	86	87	78	74	65	49	57	......	......	247.6	342.5	72	71
Cincinnati, Ohio	T.	......	100	75	76	81	86	86	88	87	86	82	78	76	82	......	......	284.1	346.0	82	79
Cleveland, Ohio	T.	......	100	38	36	43	46	67	67	73	67	61	54	49	43	......	......	188.0	342.5	55	46
Columbus, Ohio	T.	......	64	69	70	78	77	85	85	84	81	74	73	65	70	......	......	263.2	344.9	76	65
Denver, Colo	P.	......	82	65	56	74	71	66	70	67	68	67	62	57	45	......	......	224.6	344.9	65	50
Des Moines, Iowa	T.	......	40	54	65	67	67	69	71	71	72	67	62	57	64	......	......	225.9	342.5	66	60
Detroit, Mich	T.	......	0	15	32	58	75	71	79	73	76	75	56	31	44	......	......	201.8	342.5	59	53
Dodge City, Kans	P.	......	50	54	65	70	72	72	73	74	78	77	75	62	61	......	......	243.4	347.3	70	63
Dubuque, Iowa	T.	......	40	58	62	66	69	75	71	74	76	80	65	67	61	......	......	237.8	342.5	69	72
Eastport, Me	P.	......	0	41	52	65	75	69	73	73	76	74	71	62	63	......	......	226.5	339.8	67	53
Erie, Pa	T.	......	100	41	36	47	59	66	68	70	71	63	53	47	53	......	......	194.5	342.5	57	49
Eureka, Cal	P.	......	55	43	43	46	50	56	60	58	63	64	61	48	43	......	......	185.0	343.9	54	51
Fresno, Cal	T.	......	50	67	68	73	74	74	76	76	83	83	81	78	67	......	......	262.7	347.9	76	72
Galveston, Tex	P.	......	25	30	53	68	73	73	66	69	67	72	76	59	38	......	......	224.7	355.9	63	62
Harrisburg, Pa	T.	......	82	40	43	54	63	70	72	75	63	58	53	52	69	......	......	203.6	344.9	59	45
Helena, Mont	P.	......	100	44	49	70	70	76	72	69	69	72	65	61	59	......	......	221.6	336.7	66	61
Huron, S. Dak	T.	......	100	31	35	50	63	59	60	59	54	51	48	43	36	......	......	171.6	340.5	50	47
Idaho Falls, Idaho	T.	......	0	22	29	34	46	56	62	64	55	50	47	44	29	......	......	158.8	341.8	46	46
Indianapolis, Ind	T.	......	100	74	75	84	89	87	85	84	82	80	76	74	82	......	......	279.6	344.9	81	71
Kansas City, Mo	P.	......	100	73	74	77	78	76	76	83	80	76	73	70	72	......	......	262.8	346.0	76	69
Key West, Fla	T.	......	46	57	59	68	75	84	90	90	83	80	72	55	44	......	......	259.4	358.6	72	61
Little Rock, Ark	T.	......	100	79	77	85	89	96	95	97	93	91	84	72	78	......	......	303.8	350.1	87	72
Los Angeles, Cal	P.	......	67	53	59	62	65	67	69	80	80	84	80	75	60	......	......	246.4	350.9	70	64
Louisville, Ky	T.	......	95	78	77	80	86	87	87	83	83	84	84	78	80	......	......	286.7	347.3	82	75
Minneapolis, Minn	T.	......	0	20	17	23	41	41	41	52	52	43	28	27	45	......	......	121.2	339.8	36	......
Nashville, Tenn	T.	......	100	83	82	86	90	90	88	86	88	85	85	84	86	......	......	301.7	348.9	86	82
New Orleans, La	T.	......	67	53	62	64	63	65	62	67	62	57	51	42	43	......	......	207.1	354.7	58	59
New York, N. Y	T.	......	0	17	33	55	60	65	73	74	72	67	61	39	34	......	......	193.3	343.9	56	50
Northfield, Vt	P.	......	0	51	54	57	68	76	70	64	71	70	65	54	52	......	......	217.2	340.5	64	56
Omaha, Nebr	P.	......	82	55	57	71	72	71	73	68	70	67	65	53	50	......	......	225.0	343.9	65	56
Parkersburg, W. Va	T.	......	100	68	68	71	78	80	81	79	77	78	70	68	83	......	......	258.8	346.0	75	73
Philadelphia, Pa	T.	......	82	43	41	52	58	65	71	75	61	60	58	50	65	......	......	200.8	344.9	58	47
Phœnix, Ariz	P.	......	85	77	79	86	90	90	87	92	93	81	79	80	79	......	......	298.5	351.5	85	75
Pittsburg, Pa	T.	......	18	18	17	32	55	65	73	82	78	67	55	42	50	......	......	184.5	343.9	54	55
Portland, Me	T.	......	0	33	56	74	86	88	87	87	88	80	67	58	55	......	......	251.4	340.5	74	62
Portland, Oreg	T.	......	0	21	24	35	50	68	75	79	80	77	67	52	58	......	......	196.8	338.5	58	56
Portland, Oreg	P.	......	0	21	24	28	38	48	47	62	65	64	62	52	57	......	......	160.2	338.5	47	56
Raleigh, N. C	T.	......	33	22	31	47	57	65	63	68	72	66	60	45	43	......	......	189.1	348.9	54	46
Rochester, N. Y	T.	......	0	23	24	36	49	55	61	64	51	36	28	31	44	......	......	144.0	341.8	42	41
St. Louis, Mo	T.	......	100	80	79	87	91	94	95	97	97	95	89	74	67	......	......	305.4	346.0	88	77
St. Paul, Minn	P.	......	100	23	32	44	52	53	49	55	61	57	48	37	41	......	......	159.2	339.8	47	41
Salt Lake City, Utah	P.	......	36	47	49	53	61	68	65	63	65	69	70	63	53	......	......	211.1	343.9	61	42
San Diego, Cal	P.	......	79	53	57	66	76	82	87	91	89	90	87	89	76	......	......	277.5	351.5	79	80
San Francisco, Cal	T.	......	50	30	44	61	69	76	81	87	88	89	80	63	53	......	......	243.1	347.3	70	56
Santa Fe, N. Mex	P.	......	18	44	61	70	75	71	70	74	69	69	61	61	54	......	......	229.7	348.9	66	60
Savannah, Ga	P.	......	60	39	40	52	60	66	66	61	69	67	69	52	51	......	......	205.1	352.8	58	52
Seattle, Wash	T.	......	......	0	2	10	24	38	44	49	49	46	38	31	34	......	......	104.8	335.8	31	46
Spokane, Wash	T.	......	......	31	37	48	66	76	80	79	72	70	55	43	54	......	......	204.2	335.8	61	51
Tacoma, Wash	T.	......	0	6	12	25	43	59	74	76	76	64	62	51	55	......	......	172.7	336.7	51	35
Tampa, Fla	T.	......	100	71	68	67	74	75	78	70	65	63	62	63	65	......	......	244.6	356.3	69	66
Vicksburg, Miss	T.	......	60	56	65	76	80	82	91	89	89	81	72	60	47	......	......	265.9	352.8	75	69
Washington, D. C	P.	......	64	52	48	45	44	49	50	54	57	60	51	49	63	......	......	177.0	346.0	51	48
Wilmington, N. C	T.	......	33	14	36	58	66	78	78	76	76	64	52	35	18	......	......	198.0	350.9	56	53
Yankton, S. Dak	T.	......	0	25	40	60	62	67	71	72	69	62	59	44	51	......	......	197.9	341.8	58	49

TABLE XI.—*Accumulated amounts of precipitation for each* 5 *minutes, for storms in which the rate of fall equaled or exceeded* 0.25 *in any* 5 *minutes, or* 0.75 *in* 1 *hour during October,* 1897, *at all stations furnished with self-registering gauges.*

Station.	Date.	Total duration. From—	Total duration. To—	Total am't of precipitation.	Excessive rate. Began—	Excessive rate. Ended—	Amount before excessive began.	5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
	1	2	3	4	5	6	7														
Albany, N. Y.	11-12			0.47														0.30			
Atlanta, Ga.	10-11	8.03 p.m.	9.30 a.m.	1.24	8.03 p.m.	8.15 p.m.	0.00	0.25	0.38	0.42	0.43	0.44	0.51	0.59							
Atlantic City, N. J.	12			0.43														0.37			
Baltimore, Md.	12	5.35 a.m.	10.05 a.m.	1.92	6.59 a.m.	8.00 a.m.	0.14	0.17	0.26	0.31	0.48	0.52	0.67	0.82	0.92	1.05	1.21	1.35	1.45		
Binghamton, N. Y.	12			0.28														0.15			
Bismarck, N. Dak.*																					
Boston, Mass.	12			0.28														0.15			
Buffalo, N. Y.	12			0.74													0.35				
Cairo, Ill.	11			0.34						0.12											
Charleston, S. C. †	18-20			6.41														1.40†			
Chicago, Ill.	11			0.14														0.07			
Cincinnati, Ohio	19-20			0.28														0.11			
Cleveland, Ohio	21-22			0.68														0.30			
Columbia, Mo.	17			0.28														0.22			
Columbus, Ohio	11			0.25									0.24								
Denver, Colo.	25-27			1.17														0.08			
Des Moines, Iowa	16			0.37														0.20			
Detroit, Mich.	11			0.30									0.25								
Dodge City, Kans.*																					
Duluth, Minn.	18-19			0.69														0.22			
Eastport, Me.	12			0.53														0.28			
Erie, Pa.	11-12			0.80														0.31			
Galveston, Tex.	30-31	3.22 p.m.	10.17 a.m.	2.81	12.50 a.m.	1.45 a.m.	0.45	0.12	0.25	0.33	0.44	0.50	0.57	0.65	0.72	0.77	0.86	0.90			
Harrisburg, Pa.	22			0.60											0.14						
Hatteras, N. C.	12	12.20 a.m.	4.45 a.m.	1.17	3.57 a.m.	4.15 a.m.	0.35	0.12	0.25	0.60	0.77										
Do	19-20	7.30 p.m.	10.40 a.m.	4.79	7.45 a.m.	9.45 a.m.	2.47	0.07	0.18	0.24	0.29	0.32	0.37	0.42	0.52	0.67	0.76	0.82	1.09	1.34	1.57
Huron, S. Dak.	25-26			1.32														0.17			
Idaho Falls, Idaho	1			0.22							0.08										
Indianapolis, Ind.	19			0.08								0.07									
Jacksonville, Fla.	18	D. N.	9.50 a.m.	2.07	3.27 a.m.	4.10 a.m.	0.45	0.05	0.14	0.20	0.31	0.40	0.45	0.53	0.63	0.68					
Jupiter, Fla.	10	6.30 a.m.	8.30 a.m.	0.90	6.30 a.m.	7.20 a.m.	0.00	0.11	0.21	0.27	0.33	0.39	0.50	0.56	0.66	0.72	0.81				
Do	19	12.50 a.m.	2.00 a.m.	0.90	1.00 a.m.	1.35 a.m.	0.03	0.04	0.10	0.21	0.36	0.56	0.81	0.86							
Kansas City, Mo.	10-11			0.43														0.29			
Key West, Fla.	1	D. N.	8.30 a.m.	1.86	12.47 a.m.	1.40 a.m.	0.05	0.17	0.38	0.68	0.90	1.00	1.10	1.23	1.30	1.35	1.45	1.53			
Do	19	D. N.	9.10 a.m.	2.98	4.50 a.m.	5.56 a.m.	0.40	0.10	0.19	0.27	0.34	0.42	0.47	0.51	0.54	0.65	0.85	1.40			
					7.57 a.m.	8.45 a.m.		0.10	0.17	0.25	0.36	0.52	0.62	0.75	0.80	0.87	0.93	0.99			
Lincoln, Nebr.	16			0.74														0.34			
Little Rock, Ark.	30-21			1.29														0.28			
Los Angeles, Cal.	13-14			1.68														0.54			
Louisville, Ky.	19-20			1.59														0.44			
Memphis, Tenn.	31			0.51														0.23			
Milwaukee, Wis.	10-11			0.64														0.14			
Montgomery, Ala.	§			1.04														0.32			
Nantucket, Mass.	20-21			0.96														0.11			
Nashville, Tenn.	§			0.84														0.20			
New Orleans, La.	11			0.52														0.46			
New York, N. Y.	12			0.26														0.18			
Norfolk, Va.	23-24			3.19														0.24			
Northfield, Vt.	12			0.21														0.18			
Oklahoma, Okla.	26			0.40														0.10			
Omaha, Nebr.	16			0.56														0.17			
Parkersburg, W. Va.*	§			0.62																	
Philadelphia, Pa.	24-25			0.69														0.15			
Pittsburg, Pa.	7			0.12														0.11			
Portland, Me.	12			0.36											0.20						
Portland, Oreg.	20-21			0.58														0.09			
Raleigh, N. C.	19-20			1.38														0.16			
Rochester, N. Y.	20			0.35														0.11			
St. Louis, Mo.	§			0.96														0.12			
St. Paul, Minn.	15-16			0.65														0.17			
Salt Lake City, Utah	14-15			0.68														0.15			
San Diego, Cal.	14			0.59														0.15			
San Francisco, Cal.	22-23			1.39														0.27			
Savannah, Ga ‡	17-19			6.31														0.52			
Seattle, Wash.	12			0.56														0.14			
Spokane, Wash.	20-21			0.06														0.03			
Tampa, Fla.	10	4.10 p.m.	7.30 p.m.	1.00	4.18 p.m.	4.47 p.m.	0.05	0.20	0.50	0.58	0.63	0.70	0.76								
Vicksburg, Miss.	11			0.28												0.16					
Washington, D. C.	12	6.00 a.m.	11.15 a.m.	1.03	6.43 a.m.	7.07 a.m.	0.08	0.09	0.21	0.34	0.57	0.68	0.70								
Wilmington, N. C.	12	4.40 p.m.	5.25 p.m.	0.52	4.57 p.m.	5.12 p.m.	0.07	0.15	0.26	0.42											
Do*	19-20			3.24														0.67			
Yankton, S. Dak.*																					

*Record incomplete. †Self register out of order, and 5-minute values not obtainable. From 8 p. m. of 18th to 8 a. m. of 20th, 6.41 inches fell. Greatest amount of fall in one hour 1.40 (estimated), from 9:20 to 10:20 a. m of 19th. ‡Rain continued with slight interruptions for forty-eight hours from 2 p. m. of 17th to 2 p. m. of 19th. Heavy showers of short duration occurred at intervals, but rain was generally moderate. §From October 31 to November 1.

TABLE XII.—*Excessive precipitation, by stations, for October*, 1897.

Stations.	Monthly rainfall 10 inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
Alabama.	*Inches.*	*Inches.*		*Ins.*	*h. m.*	
Daphne		4.35	31			
Scottsboro		3.05	18			
Arkansas.						
Blanchard Springs		3.01	31			
Elon		3.80	31			
Luna Landing		3.82	31			
California.						
Azusa		7.55	13-14			
Fort Ross		2.83	23			
Glendora		6.45	13			
North Ontario		2.50	13-14			
Oakland		2.78	23			
Pilot Creek		2.67	23			
San Jacinto		2.90	14			
Sierra Madre		2.83	13-14			
Upper Mattole		2.65	24			
Colorado.						
Millbrook		2.80	27			
Stamford		2.90	26			
Florida.						
Boca Raton	10.01	5.00	10			
Federal Point		6.59	16-18			
Jacksonville		2.74	17-18			
Key West		3.16	18-19	1.53	1 00	1
Do				1.38	1 00	19
Macclenny		3.85	17-18			
Milton		3.14	13	3.14	1 00	13
Pensacola		3.40	*			
St. Francis Barracks		6.30	16-17			
Sebastian	10.26					
Tampa		2.90	22-23			
Georgia.						
Crescent		2.85	19			
Fleming		7.04	18-19			
Greenbush		2.58	19			
Jesup		2.87	18			
Savannah		6.31	17-19			
Idaho.						
Kootenai		2.50	11			
Kansas.						
Achilles		3.25	25-26			
Beloit		3.31	17-18			
Colby		3.25	25-26			
Concordia		2.59	16-17			
Wichita		2.88	10	2.50	1 00	10
Winona		3.00	26			
Kentucky.						
Ensor		2.74	19			
Pleasure Ridge Park		2.52	19			
Louisiana.						
Abbeville		3.60	30-31			
Farmerville		2.90	30-31			
Hammond		2.67	31			
Liberty Hill		4.50	31			
Melville				1.08	1 00	19
Minden		2.75	31			
Montgomery		3.80	27			
New Iberia		2.65	31			
Ruston		3.15	31			
Sugartown		3.27	31			
Maryland.						
Baltimore				1.38	1 00	12
Mardela Springs		3.02	24			
Mississippi.						
Greenville		3.43	31			
Greenwood		2.60	31			
Nebraska.						
Ansley		2.95	26			
Benedict		2.60	17			
Broken Bow		2.73	27			
Callaway		3.50	26			
Culbertson		3.00	25-26			
Dannebrog		2.80	26			
Dawson		2.67	17			
Divide		2.92	27			

TABLE XII.—*Excessive precipitation*—Continued.

Stations.	Monthly rainfall 10 inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
Nebraska—Continued.	*Inches.*	*Inches.*		*Ins.*	*h. m.*	
Edgar		4.20	17			
Elba		2.55	26			
Fairmont		3.60	18			
Geneva		2.62	17			
Grand Island		2.83	26-27			
Hays		2.35	24-25			
Holdrege		2.70	27			
Indianola (near)		3.11	27			
Kearney		3.45	26			
Loup		2.98	26-27			
Minden		3.59	26			
Nesbit		5.50	25-26			
Norman		3.94	27			
Ravenna		2.50	26			
Redcloud		3.00	17-18			
St. Libory		2.65	26			
St. Paul		2.63	26			
Sargent		4.12	25-26			
Strang		3.40	17			
Stratton		3.05	26			
Stromsburg		2.75	18			
New Jersey.						
Toms River		2.65	24-25			
North Carolina.						
Beaufort		6.43	19-20			
Hatteras		4.82	19-20			
Jacksonville		4.85	20			
Kittyhawk	12.29	5.44	20			
Lenoir		3.75	11-12			
Morganton		5.00	11			
Mountairy		3.51	10-12			
Pantego		3.78	19-20			
Do		3.14	24-25			
Settle		2.85	11-12			
Sloan		2.50	20			
Southport		3.18	19			
Willeyton		2.60	26			
Wilmington		3.24	19-20			
Oregon.						
Langlois		2.70	21			
Pennsylvania.						
Reading		4.47	12			
South Carolina.						
Batesburg		2.80	11			
Charleston		5.30	18-19	1.40	1 00	19
Georgetown		3.30	18-19			
Pinopolis		4.20	18-19			
Port Royal		4.93	19			
Shaws Fork		2.75	18-19			
Smiths Mills		3.75	19-20			
Tennessee.						
Decatur		2.90	19			
Texas.						
Austin		2.50	15			
Blanco		5.25	15			
Brazoria	10.23	4.90	26			
College Station		2.50	26			
Columbia		2.60	31			
Cuero		3.80	27			
Danevang		3.94	15			
Dublin				2.40	0 30	21
Fredericksburg				1.02	0 30	26
Galveston		2.81	30-31			
Houston		2.72	26-27			
Luling		3.72	15-16	1.50	1 00	26
Virginia.						
Maidens		2.51	11-12			
Do		3.20	19-20			
Norfolk		2.58	23-24			
Spottsville		3.56	19-20			
West Virginia.						
Philippi				1.00	1 00	26

*October 31-November 1.

Chart I. Tracks of Centers of High Areas. October, 1897.

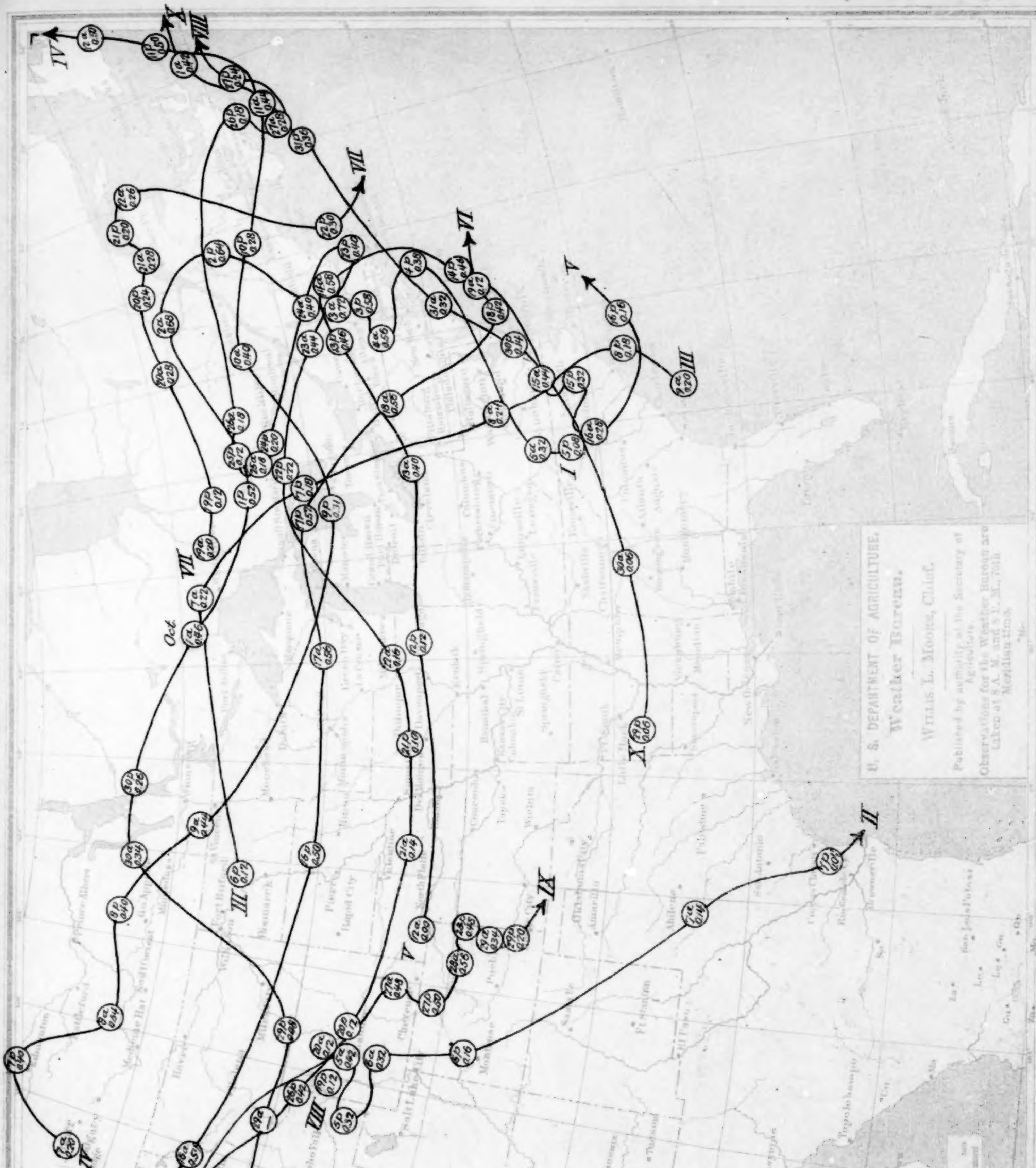


Chart II. Tracks of Centers of Low Areas. October, 1897.

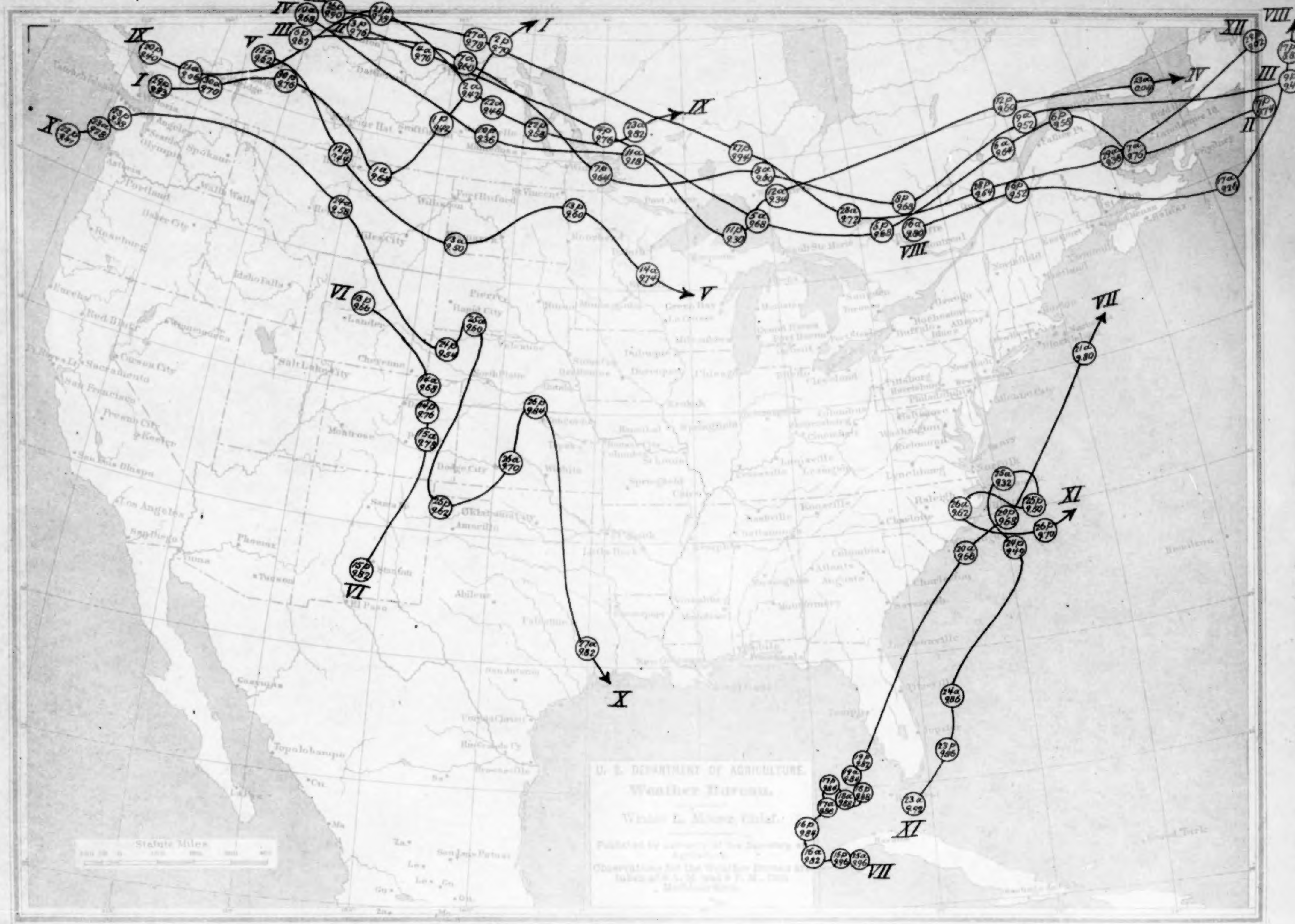


Chart III. Total Precipitation. October, 1897.

Chart III. Total Precipitation. October, 1897.

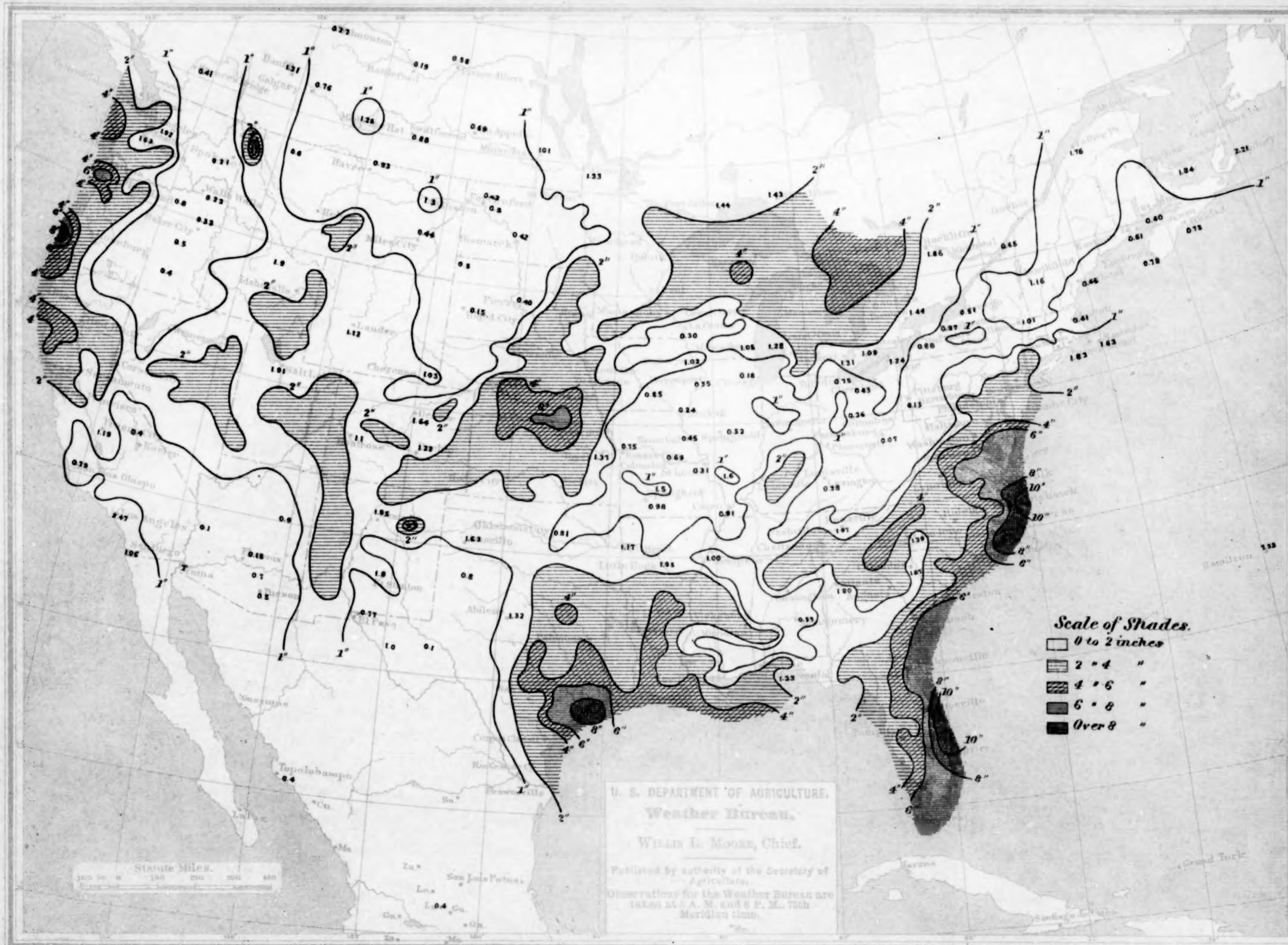


Chart IV. Isobars, Isotherms, and Resultant Winds. October, 1897.

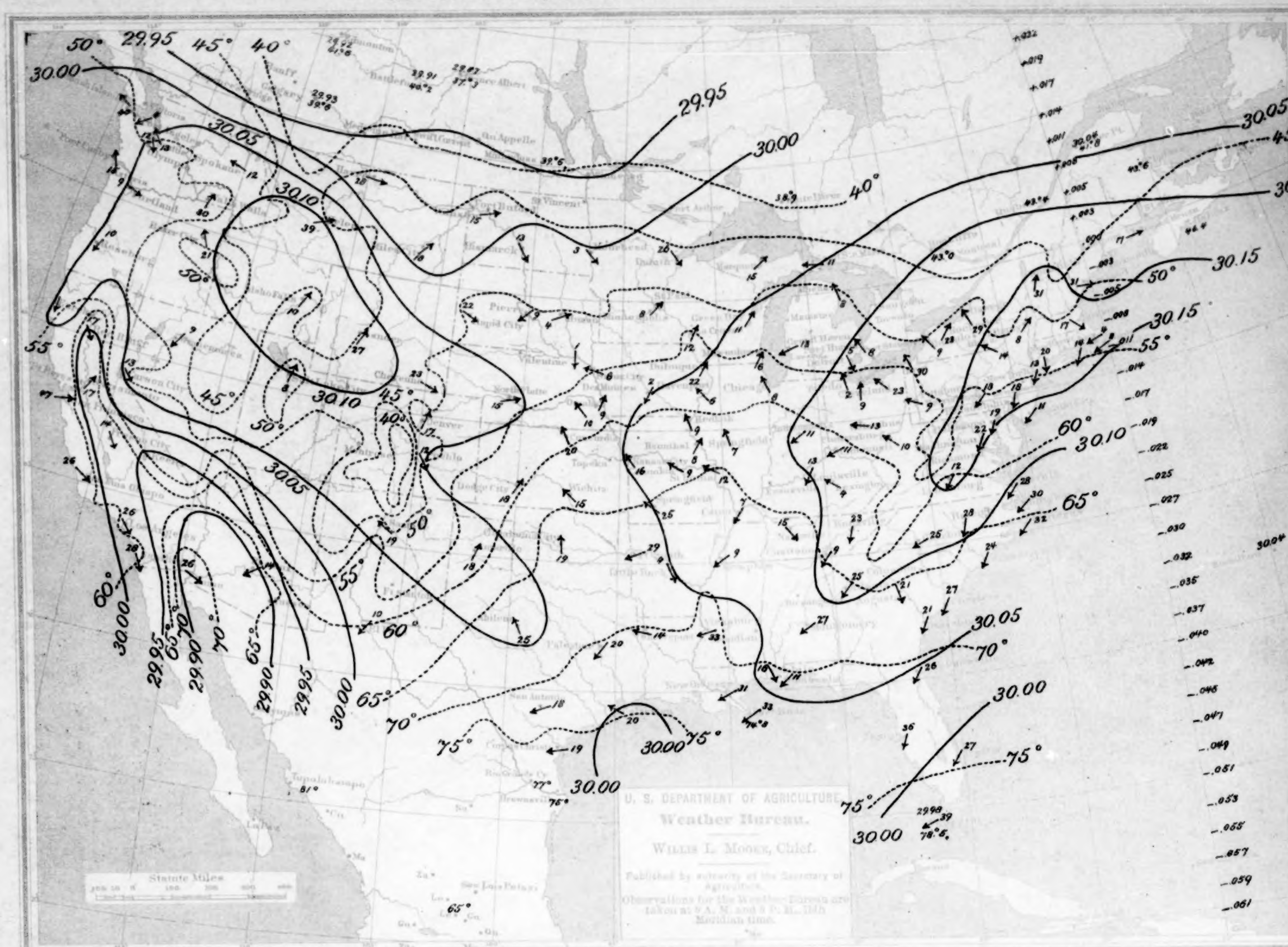
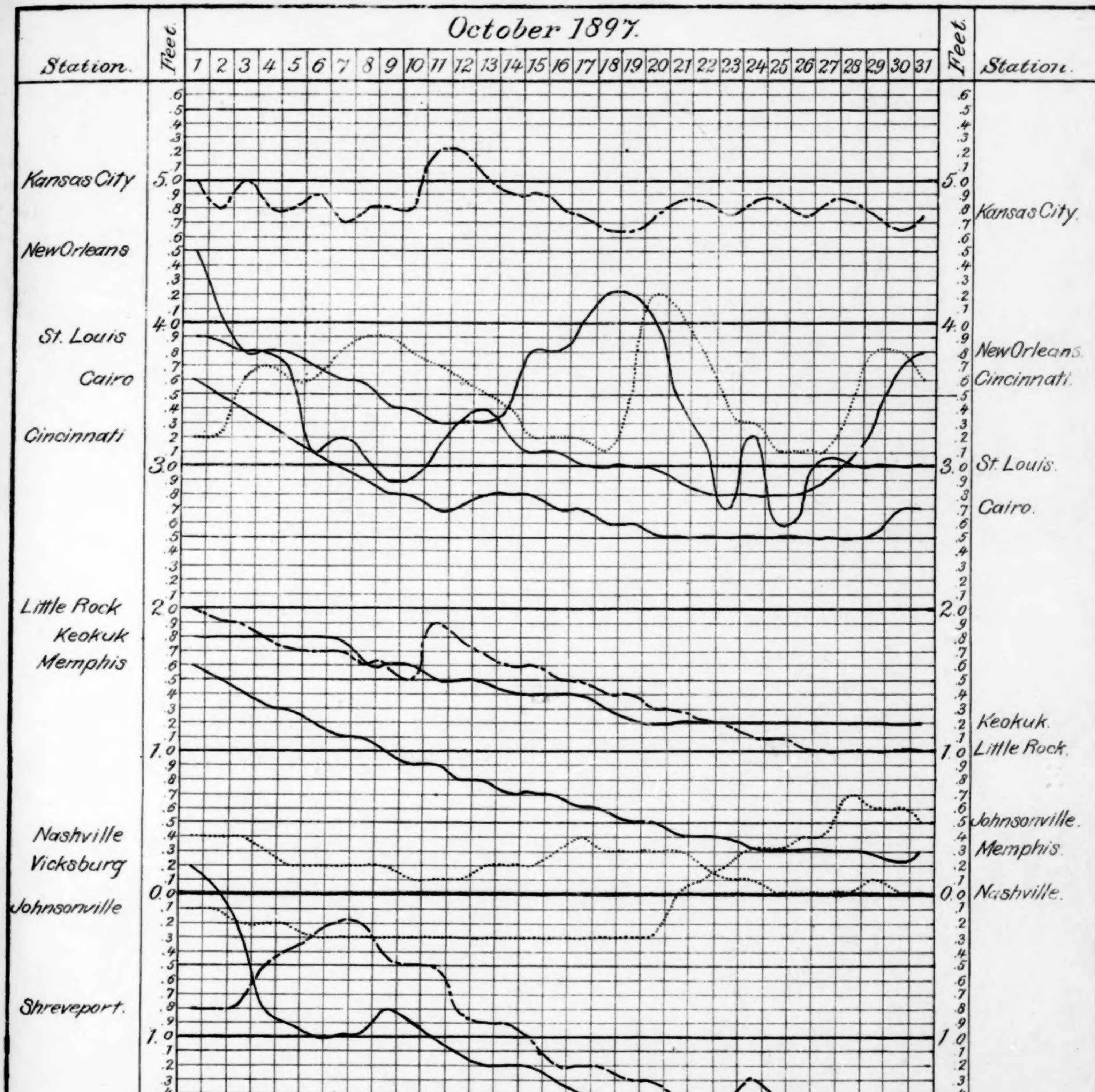


Chart V. Hydrographs for Seven Principal Rivers of the United States. October, 1897.



[illegible]

Chart VI. Depth of Snow on Ground at the Close of the Month. October, 1897.